This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

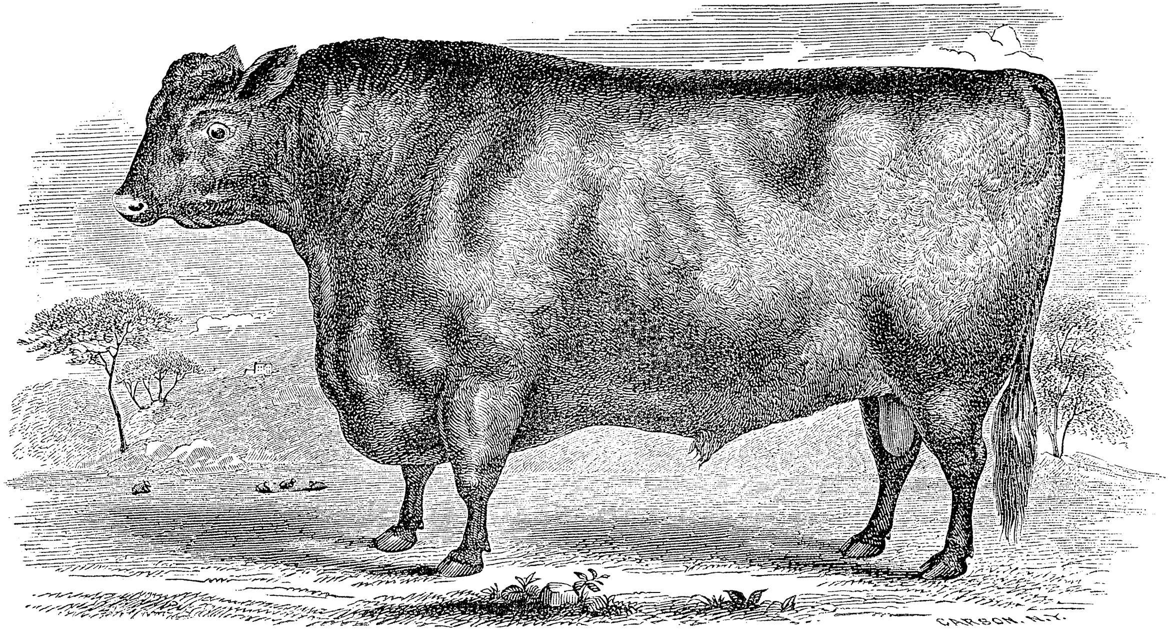
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`



PRIZE GALLOWAY BULL.

[See Pages 39 to 55, of this Volume.]

FOURTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

STATE BOARD OF AGRICULTURE

OF THE

STATE OF MICHIGAN,

FOR THE YEAR 1865.

BY AUTHORITY.

LANSING:
JOHN A. KERR & CO., PRINTERS TO THE STATE.
1865.

State Board of Agriculture.

His Excellency H. H. CRAPO, Ex-Officio,
PRESIDENT OF THE BOARD.

HEZEKIAH G. WELLS, of Kalamazoo, Kalamazoo County,
VICE PRESIDENT.

DAVID CARPENTER, of Blissfield, Lenawee County,
JUSTUS GAGE, of Dowagiac, Cass County,
ABRAHAM C. PRUTZMAN, of Three Rivers, St. Joseph Co.,
CHARLES RICH, of Lapeer, Lapeer County,
ORAMEL HOSFORD, of Olivet, Eaton County,
T. C. ABBOT, A. M.,
PRESIDENT OF THE AGRICULTURAL COLLEGE, EX-OFFICIO.

SANFORD HOWARD, Secretary.
JOSEPH MILLS, of Lansing, Treasurer.

REPORT OF THE SECRETARY OF THE STATE BOARD OF AGRICULTURE.

LANSING, December 30, 1865.

To His Excellency HENRY H. CRAPO, *Governor of the State of Michigan:*

In compliance with legal requisitions, the accompanying Report, (being for the year 1865), with supplementary papers, is herewith submitted.

SANFORD HOWARD,
Secretary of the Michigan State Board of Agriculture.

CHARACTERISTICS OF THE SEASON OF 1865.

The meteorological characteristics of the season of 1865, in Michigan, so far as regards their influence on agricultural productions, were widely different from those of 1864. In the important element of moisture, particularly, the contrast is great. Last year was remarkable for drought, but little rain having fallen from the 10th of May till late into September, and nearly all which fell during this period came in one storm in the latter part of June. This year, over a large portion of the State, particularly the central and western, the summer and early autumn were so wet as to seriously injure some farm products, and prevent the seasonable performance of farm labors. The following extract from the Meteorological Journal, kept at the State Agricultural College, by Prof. R. C. Kedzie, shows the quantity of rain in inches, which fell, from April to October, for the years 1864 and 1865, respectively:

	1864.	1865.
May,	2.87	1.772
June,	3.50	3.552
July,	1.25	3.906
August,	.395	3.381
September,	3.528	4.792
	11.543	17.403

A comparison of July and August shows that in 1864 only 1.645-1000 inch of rain fell, and that in 1865, 7.287-1000 inches fell in the same time. In regard to the quantity which fell in May and June, 1864, it should be stated that in the former month there was only fifteen-hundredths of an inch after the 10th day, and that in the latter month, three and a half inches of the whole quantity which fell, came on the 29th and 30th days. There was, therefore, in the two months, an interval of nearly seven weeks in which very little rain fell, causing a drought of much severity for the season. Through the summer of 1865, rains fell at short intervals, and with the constantly damp atmosphere which prevailed, even the surface of the ground was scarcely dried.

A breadth of twenty to thirty miles on the eastern border of the State, did not share in the rains of July (this season), which fell in the western portion. But this section, particularly the south-east corner of the State, suffered much less from drought in 1864 than other parts of the State.

The temperature of the past season (1865) deserves notice, on account of some unusual points connected with it. June gave the highest mean temperature of any month—70°.76. September was warmer than either July or August—the mean temperature of the former being 67°.66, and of the latter 65°.60 and 65°.84, respectively. The warmest day (24 hours) of the season was July 6th, the mean temperature being 79°.66; the next warmest was September 10th, the mean being 78°.33.

YIELD OF CROPS.

The unusual and continuous heat of September was of very great importance in reference to the corn crop. The comparatively low temperature of July and August left the crop at the first of September quite backward. The frequent rains had produced an abundance of stalks, but the prospect for *corn* was not very encouraging, especially considering the liability of its being injured by frost. But the hot days and nights of September filled out the ears completely, and fully ripened the crop, giving, probably, as good a yield as ever was obtained in the State. This was a most fortunate result, considering the failure of the crop by drought in 1864, and the deficiency of the wheat crop in 1865. The Commissioner of Agriculture, in his report for November, 1865, states that the increase of yield of the corn crop of 1865, over that of 1864, for the whole country, is 173,846,450 bushels.

According to the returns received by the Commissioner of Agriculture, Washington, D. C., the deficiency in the yield of wheat in the country for 1865, as compared with 1864, is 12,172,994 bushels. It will be observed that this relates only to the *quantity* of the crop. Its quality is inferior throughout the Western States. In this State the growth of straw was generally large, and the promise of an abundant crop was good till it had passed the blossoming stage. It was then discovered that the midge had attacked it, in many instances, to a great extent. Rust, also, made its appearance on many fields, induced, probably, by the prevalence of wet weather, alternating with warm sunshine. Add to these casualties the injury from rains after the crop was cut, and the depreciation in the quality of the grain must be obvious, though not easily stated in figures.

The experience of the year has given further evidence in favor of early varieties of winter wheat, as less liable to injury from the midge. The Early Boughton made a fair crop in some instances, this season, where the Soule's, sown at the same time on the same field, almost totally failed.

Barley is not extensively grown in the State. The crop was injured by the weather in about the same degree as wheat. Oats suffered less. The yield was unusually large, though there was necessarily considerable waste during the long process of curing, and the quality was more or less injured.

The hay crop was large, but owing to the "catching" weather the period of harvest was prolonged till the grass was, in many instances, too ripe, and the quality of hay is generally inferior. The continuance of moist weather caused a luxuriant second growth, but, unfortunately, the almost daily rains of September either injured the hay, or caused the cutting of the crop to be deferred until too late in the season.

Buckwheat succeeded better than it has done for one or two previous years, the absence of frost causing it to mature fully.

Potatoes came up in yield pretty well to the crops of former times, when the rot was unknown. The appearance of the crop was healthy and strong through the whole period of its growth, except with some delicate kinds, or fields on which drainage was required. It should be borne in mind that the season presented in a striking degree those peculiar features which have generally been regarded as most favorable to the rot or potato disease, viz: superabundant moisture, with sudden changes of temperature, and sudden and frequent changes from fair to foul weather. Yet the crop was comparatively free from disease when taken from the ground, and with the exception of a few localities where the rains were very copious, but little complaint has been heard of its rotting since. The hope is therefore indulged that the disease which for twenty years has been so destructive to this crop, may have run its course, and that something like the success which formerly attended potato cultivation may be yet attained. It will be well, however, for the farmer to bear in mind that there is a great difference in the constitutional hardiness of varieties, and their ability to withstand the influences which predispose to disease. On this account such kinds only should be planted as are known to be hardy.

Of the larger fruits, apples have given a fair yield in some sections of the State, but on the whole the quantity obtained was considerably below an average crop. The great demand, however, in consequence of the scarcity in the State of New York and the New England States, has probably made the crop in Michigan one of the most valuable ever obtained here.

The peach crop was limited to comparatively small districts along the shore of Lake Michigan. A few only were obtained in the inland sections. In some particularly favored localities in the central part of the State, fair crops were obtained. Mr. J. W. Yawger, of Lansing, whose garden is on the bank of Grand River, had an abundant crop, consisting in a considerable degree of the finest varieties. The general failure was caused by a frost in the spring at the time the fruit was setting. The prevalence of an easterly wind at that time, prevented the country along the western shore from having the usual protection from the lake. With a westerly wind the temperature is so modified that frost seldom does injury near the lake.

Pears generally did well. In some sections the pear-blight has attacked the trees. This mysterious disease, from which Michigan has hitherto been nearly exempt, has been the most serious obstacle to successful pear culture in the older States of the country. Whether it is about to appear here with the virulence which has marked its progress elsewhere, cannot be told. In regard to means of prevention, the avoidance of stagnant water about the roots of the trees, by under drains, is most important; and the cutting off of the diseased limbs and burning them, as soon as they are attacked—which is easily known by the foliage and bark turning black—is the best prescription for checking its spread.

Plums, of the finer varieties, are in most places attacked by the curculio to such an extent as to nearly destroy the crop. The coarser varieties are less esteemed by the "little Turk," and they were quite abundant the present season over a considerable portion of the State. The curculio is always more injurious on light soils than on those of a compact nature. On some clayey soils there were good crops of fine kinds this season.

Grapes are annually increasing in the State. The present season was in some respects unfavorable to the crop. The long-continued damp weather produced mildew, and much fruit rotted. The injury from this cause was not, however, so great in this State, (even in proportion to the extent of the crop), or along the Ohio shore of lake Erie, as in the lower valley of the Ohio river. In the neighborhood of Cincinnati the crop may be said to have been a total failure. In this State, fine specimens of choice varieties were exhibited at many of the agricultural shows. The favorable weather of September caused the Isabella to ripen perfectly, even in localities considerably north of the Capital.

ADVANTAGES OF MICHIGAN FOR THE PRODUCTION OF FRUITS.

The great advantages of Michigan for the production of fruits, are becoming every year more obvious. A large portion of the soil is evidently very good for apples and pears, and there is a considerable extent of territory on which peaches will do well. The position of the State in regard to a market for fruit, is particularly favorable. On the east we have the demand from our seaboard cities, together with that of the cities of Canada; while on the west are the already important and growing markets of Chicago and Milwaukee, which for years to come must be in a great degree dependent on Michigan for the larger fruits. With these facilities for a market, there can scarcely be a question that apples and pears may be produced here in much larger quantities than they have hitherto been, with a certainty of finding ready sales at remunerative prices.

The benefit of the protection against severe winds, which is afforded to fruit trees by the forests of Michigan, are unquestionably great, and by the exercise of judgment in clearing the land and in providing for the future growth of timber, the necessary protection may always be obtained. But in addition to the advantages of soil and natural shelter of the forest, there is another element whose action in the modification of our climate is of great importance, viz: the water with which the main division of the State is nearly surrounded. The influence of Lake Michigan on our western shore is similar, though of course less in degree, to that of the Gulf Stream on the British

Islands and the coast of Northern Europe. The flow of the warm current of the ocean gives to those countries a climate of much less severity than they would otherwise have. So, too, the water of our lake imparts heat to the air which comes in contact with it, and the western winds bring it to our shore. The effect is seen in the higher temperature, at certain seasons of the year, of points on this side of the lake as compared with points in the same latitude on the Illinois and Wisconsin side. Rev. Wm. M. Ferry, who has resided at Grand Haven for the last thirty-four years, informs me that in the coldest weather of winter the mercury is generally from ten to twenty degrees higher at Grand Haven than at Milwaukee, and this, probably, might be taken as a fair representation of the difference in temperature at opposite points along the eastern and western shores of the lake, where the breadth of water is the same. The result upon vegetation is what might be expected—that the more tender species are often injured on the other side of the lake when they escape on this side, as demonstrated by the production of peaches along our western shore, a fruit scarcely seen in the same latitude on the other side of the lake. With the shelter of trees and the comparatively mild winter temperature caused by the lake, the peach crop is considered one of tolerable certainty in several of our western counties.

Experience has proved that even on the most sandy soil on our western shore, peaches will do well. Old residents there state that the crop was nearer a failure this year than they ever knew it to be before. Yet there were peaches all along the coast as far north as Benzonia, from which neighborhood some were exported. Such is the confidence felt in the certainty and profit of this crop, that in some sections, particularly in Ottawa county, considerable land has changed hands within a few years to be devoted to peach trees—plantations of ten to twenty acres and upwards being frequently met with.

How this sandy land will do for other fruits remains to be proved. It is proper to state, however, that the results of some experiments which have been made in reference to the production of pears, are thus far highly favorable. Rev. Wm. M. Ferry, of Grand Haven, has twenty acres in one body, set in peach, apple and pear trees, grape vines, &c. The ground was originally covered with a dense hemlock and pine forest, which was cut down for the purpose of making a fruit plantation, leaving the contiguous timber in such a way as to afford protection from the coldest winds. All the trees are in fine condition, but from causes before mentioned, there were few peaches this season. Last year there was a fair crop. The pear trees are mostly on quince stocks. The oldest have been set three years. Some of them bore last year, and this year they had generally as much fruit as they ought to bear, the appearance of the fruit in August being very fine. The grapes, also, both those in the open air and those under glass, gave promise of a fair crop, considering the age of the vines. The ground where the pear trees and grape vines are set, was manured with stable manure.

Among numerous trials in grape-culture which have been commenced in the neighborhood of Grand Haven, those of Messrs. Cutler & Savidge, of Mill Point, deserve special notice. They have half an acre in vines which gave their first crop, after being properly trellised, this year. The crop in the middle of August was very promising—the quantity on the half acre being estimated at four tons. The actual yield has not been learned at this writing. The varieties are chiefly Isabella, Catawba, and Concord. The latter made, on the whole, the most promising show at the period before mentioned. Besides the half acre mentioned, Messrs. C. & S. have many younger vines, and it was understood that Mr. Cutler had lately planted a vineyard comprising several acres.

As evidence of what the more tenacious soils of this section are capable in regard to the production of the larger fruits, reference is made to the fine crops of apples and pears obtained by Hon. Henry Pennoyer, of Nunica, Ottawa county.

His farm lies just on the border of the drift-sand of the lake. His orchards of these fruits, of eight years standing, already produce good crops. A dealer from Milwaukee offered, in August, three dollars per bushel, at the farm, for all the pears.

As an example of successful pear culture in the more central portion of the State, the beautiful orchard of S. O. Knapp, Esq., of Jackson, deserves notice. He has about five hundred trees, standards and dwarfs, of various ages, whose appearance in June was very fine. No statistics in regard to the production of this orchard have been received, but it is hoped that Mr. K. will, another year, give the public the benefit of his experience in this important branch of horticulture. It may be mentioned as a striking feature in his management, that the main pear orchard is protected against severe winds by very thick and strong hedges of several species of native thorn. On some lines, however, screens of arbor vitæ and hemlock are being reared. Both these and the thorns evince a degree of skill and care in training, which reflect much credit on the proprietor.

NEW CROPS.

Under this head may be placed crops, the introduction of which into the State is comparatively recent. The most prominent of these is

SORGHUM.

It is well known that this plant has been more or less cultivated in this State, for the production of syrup and sugar, for several years. It has attracted so much attention, and so much has been published in regard to it, that it is unnecessary to occupy space with general remarks. It seems to be the opinion of persons best qualified to judge in the case, that so far as regards the production of a substitute for molasses, the manufacture of sorghum syrup may be considered established in a large portion of this and other Western States. There is less certainty in regard to the profitable production of sugar, and further experience only can fully settle the question.

To John Richard, Esq., of Tecumseh, who has given much attention to the cultivation of sorghum and its products, I am indebted for valuable information in regard to the present status of this business in the State. Under date of November 14th, he writes as follows:

"The season just past has been remarkably favorable for the growth of sugar-cane, and the quantity and quality of syrup manufactured throughout the State has been unusually large and good. Wherever there have been failures, they have been owing to want of proper care in harvesting and securing the cane.

"The amount of syrup made in this State this season, may be safely estimated at 400,000 gallons. It is early in the season to report on sugar. As far as I know, sugar has been made in some instances from the Otaheitan cane, but none as yet from the Chinese.

"There has been much improvement in the culture of cane and in the manufacture of syrup, during the past year. The business is yet in its infancy, and although there are many difficulties connected with it, the enterprise and ingenuity of the people of the Peninsular State are fast overcoming them all.

"Much loss has been sustained by the introduction of worthless varieties of cane, called early varieties; most of them produced by a continuous planting of seed raised in the State. But the farmers are now mostly well informed as to the best varieties, and are discarding all others—much to the discomfiture of speculators in seed.

"The southern tier of counties have been engaged in growing sugar-cane and manufacturing syrup and sugar for several years. During the past year it has been introduced into Allegan, Ionia, Eaton, Ingham, Shiawassee and Genesee counties."

TOBACCO.

The cultivation of this crop is extending in the State, the high prices caused by the late war greatly increasing the inducements thereto. In the absence of statistics it is impossible to estimate the value of this product. The quantity which can be produced to the acre seems to be equal to that obtained in most other sections—a ton being a good yield. Whether the quality of that grown here, though said to be good, will ever equal that of the Connecticut valley, remains to be seen. Some attempts to manufacture cigars from Michigan tobacco, indicate that the crop can thus be turned to the best account. Mr. M. K. North, of Lansing, has had cigars made from tobacco grown on his farm, which, it is stated, sell readily at satisfactory prices.

RHUBARB.

Under the attractive name of "wine-plant," the cultivation of rhubarb—*Rheum raphonticum*—has of late years been considerably extended, particularly at the West. From the juice of the leaf-stalks, combined with sugar, a liquor called wine is made. In some of the central and southern counties of this State, the business has been engaged in somewhat largely. The principle of the adage, that "A rose by any other name will smell as sweet," seems to have been ignored in this case—the wine-makers apparently supposing that rhubarb-juice under some other name, would not be quite so sour.

It is hardly probable that this so-called wine can long find a market to any considerable extent, especially under the constantly increasing production, casualties excepted, of wine from grapes. The fact is fully established, that varieties of grapes which make excellent wine, without the addition of any substance whatever to the juice, will ordinarily mature perfectly over a large portion of this State. In view of this fact, it is not easy to see any inducement for attempting the production of what, at best, can be only an inferior substitute for real wine. As for the speculation in rhubarb roots under the name above mentioned, it is merely a humbug of even lower grade than "multicaulis," or "white willow."

INJURIOUS INSECTS.

In addition to the various insects which have assailed the crops of Michigan for several years, we are lately threatened with others, some of which are very destructive to the plants or trees on which they feed. The most formidable of these new insect enemies is the

CANKER-WORM.

This insect has appeared in at least one locality in this State. It was first noticed on some trees in the orchard of Mr. Wilson, of Marengo, Calhoun Co., in 1863. Having heard that what some persons called the "army-worm," was destroying the foliage of the trees in this neighborhood, I concluded to ascertain, if practicable, what insect it might be. On visiting the locality on the 12th of June last, I found several orchards of from ten to twenty years' standing, completely defoliated. On examining the trees it was ascertained that the worms were nearly all gone. The manner in which the mischief had been done, plainly indicated its author; but it was only after considerable search that one of the culprits was found, though several other species of insects, in different stages, were met with. An impression seemed to prevail that a shower of rain which had lately fallen, had driven the worms from the trees. But this probably had nothing to do with their disappearance; they had reached the full period of their existence in the larva state, and had instinctively descended into the ground to undergo their final transformation.

The habits of insects, in this as well as in other respects, are not as well understood by farmers in general as they should be.

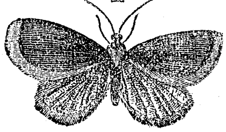
Insects are hatched from eggs, and all those of the same species, in a given locality, being subjected to like influences, are hatched nearly at the same time. The emergence of the larva from the egg corresponds to the development of the vegetation on which they feed. Thus the leaves of the apple tree are developed just as the tent-caterpillar and canker-worm are hatched, and the temperature which pushes on the growth of the foliage, causes the worms to grow at the same rate, and the leaves and the worms reach their full size about the same time, when the latter suddenly stop eating and leave the trees, to live out, in another form, the alloted period of their existence.

The canker-worm belongs to the family of *Geometers*, or "measuring-worms," so called from their manner of progression. They have ten legs, six jointed ones at the fore-part of the body and four prop-legs at the hinder extremity. When they move they bring the hinder part of the body forward, which arches the middle portion, then stretch out the forward part to full length, and hold on with the forward legs while the hinder ones are again brought forward—thus *spanning* or measuring the ground they pass over. The insect bears a very close resemblance to a European species of the same genus, but is considered by Harris and other entomologists as distinct, and indigenous to this country. It was described many years since by the late Prof. Peck, of Cambridge, Mass., under the name of *Phalœna vernata.* It belongs to the genus *Anisopteryx,* "so named," says Harris, "because in some species the wings in the two sexes are very unequal in size, and in others the females are wingless."

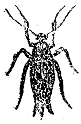
The ravages of the canker-worm have been greater in the eastern parts of Massachusetts and Connecticut, and in Rhode Island, than in any other part of the country. *Why* it should be so is not very obvious. But I believe it to be a fact that for many years after it was very destructive to orchards near the coast in Massachusetts, it was not seen west of the Connecticut river, and it is only within a year or two that I have heard of it west of the Hudson. As the females are without wings, a comparatively narrow breadth of water forms a barrier which obstructs their progress, and the transportation of young trees, to which the eggs are attached, is probably the way in which the insect is chiefly spread over the country—although we may not, perhaps, be able to assign a very satisfactory reason why it should not be indigenous to one section as well as another, in the same latitude.

Before speaking of the means of preventing the ravages of this insect, it may be well to notice its habits, so far, at least, as relate to the manner in which it is produced on the tree. In its perfect state, the male is a winged, ash-colored moth, the body of which is nearly half an inch long, the wings expanding to about an inch and a quarter. The female is wingless and its body is considerably larger than that of the male. They are not unfrequently distinguished as "millers and grubs."

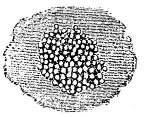
1



2



3



4

In the accompanying cut, fig. 1 represents the male; fig. 2, the female; fig. 3, eggs; fig. 4, the larva, or worm.

Having undergone, in the ground, their transformation from the larva, they appear in the perfect state chiefly in spring. It was formerly supposed that they appeared wholly at this season, which was the reason why the name *vernata* was applied to the species by Prof. Peck. But it is well known that the recurrence of mild weather after severe frost will often bring them out in considerable numbers in November, or at any subsequent time when the ground is thawed, or partially thawed.*

The male is very active, but the female, loaded with eggs, is clumsy, and in her attempts to climb the trunk of the tree would, unaided, make comparatively poor progress. The pairing of the sexes, however, takes place at this time, and the males during connection aid the females in their ascent. The eggs are deposited in clusters of a hundred or more, in the forks of the small branches, near the buds, and, as before remarked, when the buds swell and open, the eggs hatch and the young larva commence feeding. At first, from their small size, they attract but little attention from persons not accustomed to them, but during the latter part of their period of life in the larva state—which is about four weeks—they grow rapidly and eat voraciously, often divesting the most flourishing trees of all appearance of greenness in a few days.

The canker-worm seems to prefer the foliage of the apple tree, though it will eat that of the pear, thorn and a few other trees, particularly the elm and basswood. The trees whose foliage it destroys, make an effort to produce a second growth of leaves the same season, and sometimes a few imperfect blossoms, followed by worthless fruit, are produced for one or two seasons. But the defoliation cannot long be borne, and its repetition for a few seasons will destroy the tree, or so derange its functions that it will die a lingering death.

---

* I expected the insect would make its appearance in the perfect state in the neighborhood before mentioned, during the mild weather of November, this year. I therefore wrote to Mr. Allen T. Lacey, of Marengo, and requested him to be on the lookout for "millers and grubs," in their ascent of the trees at the time indicated. On the 20th of November he wrote me that from close examination, he was confident none had appeared at this date. Not finding them above ground, he was induced to dig round the trees, where, at the depth of a few inches, great numbers of chrysalides were found. A box containing specimens of these was forwarded to me by Mr. Lacey. I examined them on the 22d of November, and found that the wings of the males were about half grown, and that the eggs in the females were so far developed as to be distinctly seen with a magnifying glass. A few days of favorable weather would undoubtedly bring them out.

Remedies or Preventives.—It is obvious that the most effectual of these consist in preventing the perfect insect from ascending the tree. The application of a belt of tar to the trunk was resorted to at an early day, and has probably been used more than anything else. But tar injures the tree, and to be effectual must be applied every day, or nearly every day, while the insect *runs*. To obviate the injury to the tree from tar, bandages of old sacking have been first fastened round, the cloth then saturated with a thick clay wash, on which, when sufficiently dried, the tar was laid. This is one of the best methods that has been adopted. The strips of cloth should be eight or ten inches wide, and when fastened round the tree, the tar should be applied near the upper edge to prevent it from running down on the tree. The bandages should be tied round the tree with strings, and when the insect has stopped running for the season, they may be taken off and kept under cover for future use. To prevent the tar from hardening, as it is liable to do, cheap fish oil has been mixed with it. Probably petroleum or coal oil would do as well. Coal tar may also answer instead of that from pine wood. But under any circumstances the business of tarring must be closely attended to. Wherever the insect has been discovered, the owners of apple-trees should be on the look-out for its ascent from the first thaw that occurs after the ground has been hard frozen, till it is again closed, or till the *running season* is over in the Spring.

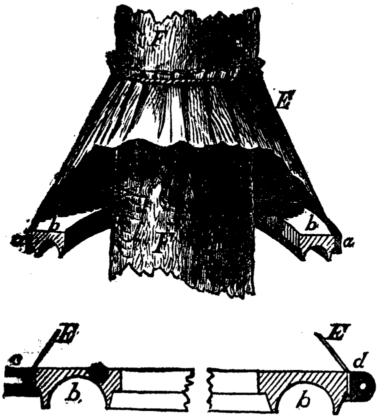
The insect is chiefly nocturnal, and commences its movements at twilight. Hence where tarring is practiced, it should be done just before the insects commence their march for the ensuing night. The tar must be applied with considerable care. A belt of three inches in width will generally be sufficient; but there must be enough all round the tree to catch and hold all the insects that attempt to pass. Sometimes, where the belt of tar is narrow, and especially on the upper side of a leaning trunk, the insects will *bridge over* the tar—that is such numbers will crowd to a particular point that after as many have got stuck as the tar can hold, others travel over their bodies with impunity, and pass up into the branches of the tree. All such weak places in the lines of defense must be carefully guarded. The tar is usually applied about two or two and a half feet from the ground.

Various other modes of prevention have been recommended, some of which have been adopted with more or less success. A strip of India-rubber cloth, an inch wide, and a strip of tin or zinc, two and a half or three inches wide, nailed or fastened to the cloth—the tin or zinc inclining outward from the tree at an angle of forty-five degrees—is said to have proved effectual, as the "grub" or female insect cannot crawl over or under the metal. The materials cost in Massachusetts, as stated, twenty cents for each "ordinary sized" tree.

A "Tree-protector," invented by Josiah Foster, of Sandwich, Mass., consists of a narrow trough of tin or zinc, to be filled with oil, suspended by a strip of cotton cloth fastened round the tree, and spreading outward several inches from the trunk. I have seen this apparatus, but never tried it, and cannot speak as to its effectiveness.

A belt of sheep-skin with the wool on, fastened round the tree, the wool-side out, is said to prevent the ascent of the "grub." If this will answer, it is a cheap and convenient plan. The saturation of the wool with kerosene oil is said to be an advantage. It would probably be advisable to use skins on which the wool should be soft, and the fibres not united or attached together at the outer end. The compact and crusted fleeces of some Merinos, would not be likely to hinder the ascent of the insects.

But perhaps the most effective apparatus which has yet been brought out, is "Merritt's Patent Tree-Protector." It will readily be understood by the aid of the accompanying cut and description:



bb represents a ring of glass, protected by the iron fender *aa*, and suspended from the tree *F* by a tent of cloth *E*, which is clamped tightly between the glass *bb* and the iron *aa*, so that the glass and iron do not come in contact. The under side of the glass ring *aa* is an inverted groove about $\frac{5}{8}$ of an inch in diameter.

It is said to have been demonstrated that the female insect cannot cross this smooth semi-circle of glass. The apparatus is obviously very durable. When the running season of the insect is past, or when the foliage of apple-trees begins to appear, the Protector should be taken off and laid under cover for future use. Any eggs that may have been laid under the canvass should be carefully scraped off and burnt.

This apparatus is the invention of Benjamin Merritt, Jr., of Newton, Mass., and is made and sold by the American Tree Protector Company, No. 19 Phœnix Buildings, Boston, Mass. It is sold at ten cents per inch, inside diameter—the sizes ranging from two to thirty-six inches in diameter. Very clear directions for attaching the apparatus to the trees, &c., are given in a pamphlet which may be had gratis on application to the agent of the Company, as above.

Very crude and unreasonable directions are sometimes given in regard to preventing the ravages of this insect. Speculators are ever on the alert with their numerous inventions. A man in an Eastern city, who makes what he calls "muriate of lime," states, lately, that its moderate application to the ground under trees attacked with the canker-worm, will wholly prevent the ravages of the insect the next season, besides greatly benefitting the trees. And yet it is but a few years since it was proved by the most careful and thorough experiments—the results of which were published—that canker-worms were so indifferent to this so-called muriate of lime, which is merely burnt oyster-shells and salt, that they would pass through their transformations in a soil composed of fifty per cent. of this substance!

It is surprising, as well as amusing, to see what ignorance prevails in regard to this insect, even in sections where it has long been very destructive. During the discussions which have lately been carried on in some of the Eastern papers, one writer stated that the *female* was the "winged insect." Another writer contradicted this, but said it would be very difficult to prevent the females from getting into the tree, as "the males could take them on their backs and fly up with them."

The canker-worm has various natural enemies, by which great numbers of them are destroyed. Many birds eat them. Hogs and domestic fowls, when they have access to orchards where the insect abounds, devour great numbers in the pupa and perfect state. A species of mud-wasp, after having built cells for its eggs, leaving a hole at the top, stuffs the cells with canker-worms as food for the young wasps, and plugs up the holes. It is also, according to Harris, attacked by a carniverous beetle, and destroyed to a great extent, as well as by several species of parasitic insects.

The young worms are sometimes destroyed by severe storms. They do not protect themselves by a web, like the tent-caterpillar, and consequently are much more affected by unfavorable weather. Twice, since the commencement of this century, has the canker-worm been nearly exterminated in Eastern Massachusetts, by the prevalence of long, cold, north-east storms, which occurred just after the eggs hatched.

It is to be hoped that the most effective measures may be taken to prevent the spread of this destructive insect in this State. Our farmers, being generally unacquainted with it, may not fully realize the injury which it is capable of inflicting on their orchards. A few years' experience will convince them that it is an enemy which will render the exercise of constant vigilance the price of every apple that can be produced.

"THE NEW POTATO-BUG,"

As it is called, is another insect from which we are in danger of injury, although it may not as yet have appeared within the boundaries of this State. Some fear was expressed that it had made its appearance in Ottawa county last summer; but on visiting the locality, I found the insect which had caused the alarm was an old but not very formidable enemy—a species of cantharides, or blistering beetle, *Lytta atrata.* But as the "New Potato-bug" has become very destructive in Iowa, Illinois, and Wisconsin, it will probably soon be on our southern border. Our western front being guarded by a great breadth of water, is probably secure from invasion from that direction. Believing that a knowledge of the habits of this insect will be of service to our farmers, I copy from the *Practical Entomologist,** some remarks on its natural history, by Benj. D. Walsh, M. A., as follows:

"There is a new and very destructive enemy of the potato, which within the last five years has spread from Colorado and Nebraska into Iowa, and within the last year and a half has crossed the Mississippi into Illinois, and as it seems, into Wisconsin also; whence in course of time it will probably travel onwards to the Atlantic, establishing a permanent colony wherever it goes, and pushing eastward at the rate of about fifty miles a year. The following extracts will give some idea of the way in which this insect operates, where it has once made itself a home, and of the dates of its first appearance in different localities.

"Thos. Murphy, of Atchison, Kansas, says that in August, 1861, they were so numerous in his ten-acre garden, 'that they would almost cover the whole potato-vine, eating up everything green on it,' and that he has 'often in a very short time gathered as many as two bushels of them.'—(*Valley Farmer*, July, 1862, p. 209.)

**The Practical Entomologist*, a monthly bulletin, published by the Entomological Society, of Philadelphia, for gratuitous distribution among Farmers and Agriculturists.

"In August, 1861, J. Edgerton, of Gravity, Iowa, says that 'they made their appearance on the vines as soon as the potatoes were out of the ground, and there being a cold, wet spell of weather about that time, they devoured them as fast as they were up.'—*Prairie Farmer*, August 29, 1861, p. 116.) And from New Sharon, Iowa, Dr. Fitch was informed in 1863 "that some have been discouraged from planting potatoes, the ravages of this potato-bug have been so great.—(*Trans. N. Y. State Agr. Soc.* 1863, p. 798.)

"D. Kilpatrick, of Linton, Iowa, under date of June 30, 1865, says 'I took more than a gallon of bugs this morning from eleven rows of potatoes eight rods long. Eternal vigilance is the price of potatoes in this section.'—(*N. Y. Sem, Tribune,* July 18, 1865.)

"Norman Matteson, of Iowa, June, 1865, says that 'the only way they can grow potatoes there is to go over the field every day, and destroy the eggs of the potato-bug, which are laid upon the leaves.'—(*Ibid.* July 7, 1865.)

"Later in the year 'Dr. Trimble placed upon the table of the New York Farmers' Club a large handful of letters, boxes, bottles and packages from Iowa, all of them containing a repetition of the same sad story, touching the terrible pest now afflicting potato-growers at the West.'—(*Ibid.* Aug. 1, 1865.)

"In August, 1864, I received from Prof. Worthen, the State Geologist of Illinois, specimens of this insect, with a statement that 'it is committing the most destructive ravages on the potato crop in the vicinity of Warsaw, [a town on the Mississippi river, in Central Illinois,] so as to threaten the loss of the entire crop on many farms.' I find that the same insect in the same year, appeared on the potato in considerable numbers near New Boston, Illinois, another town on the Mississippi river, a little above Warsaw. In the autumn of the same year I captured myself two specimens in Rock Island, another town still higher up on the same river; and in 1865 it has been quite abundant there, completely destroying some pieces of potatoes and utterly ruining the egg plants in my garden; but up to this date it has not reached a point lying thirty miles to the east of us in such numbers as to be noticed by farmers. I hear from reliable sources that it has also swarmed on the potato this year near Mt. Carroll—a point situated about ten miles from the Mississippi, near the northern border of the State—and in the neighborhood of Alton, which lies on the east bank of the Mississippi, not many miles above St. Louis. It does not appear to have advanced as yet any considerable distance into the interior of the State; but from the above facts it results, that it must have crossed the river into Illinois in 1864 and 1865 at no less than five different points, the northernmost of which lies over two huudred miles in a straight line from the southernmost.

"Hitherto noxious insects in the United States have been found to travel from the east toward the west. We have here the first instance on record of a noxious insect traveling from the west toward the east.

"But, it will be asked, where does this insect come from? And how does it happen that it did not trouble the Iowa farmers before 1861, and the Illinois farmers before 1864? I believe that I can explain this satisfactorily. Unlike several other noxious insects, it is not a general feeder, but is confined to plants belonging to the botanical family, *Solanaceæ*, and especially to the genus *Solanum*, which includes the Potato, the Tomato, the Egg-plant, and a weed called the Horse-nettle, found more usually in the Southern States, but which also grows in certain localities in Iowa.* In 1864, Dr. Velie, the ornithologist of Rock Island, Ill., and Dr. Parry, the botanist of Davenport, Ia., both saw this insect in very great numbers

---

*Mr. Terry of Crescent City, Iowa, states that in his neighborhood it attacked the Horse nettle in 1863.—(*Prairie Farmer*, June 6, 1863, p. 356.)

in Colorado, feeding upon a wild species of *Solanum*—the *rostratum* of Dunal—which is peculiar to that region of country, and is not found east of the Mississippi river; and to the former gentleman I am indebted for numerous specimens collected by him on this plant, which are undistinguishable from those found on the potato. Assuming, therefore, that this wild *Solanum* is the natural food of the insect, and that the region of country bordering on the Rocky Mountains is its natural home, its range would for a long series of years be limited by the range of the plant that it feeds on. But in the process of time civilization marched up to the Rocky Mountains—potatoes were planted in Kansas and Nebraska and Colorado—and the insect discovered that one species of *Solanum* was about as palatable as another. Having thus acquired a taste for potato leaves, it would naturally spread eastward from potato patch to potato patch, till it overspreads Iowa, and finally overleaped the Mississippi into Illinois. In confirmation of this theory, R. W. Hazen, of Fremont, Dodge Co., Nebraska, says that 'the potato-bug which is so destructive in that region was first discovered in 1859, about 100 miles west of Omaha City, whence they have been marching eastward annually.'—(*N. Y. Sem. Tribune*, July 18, 1865.) From Omaha City to Rock Island is over 260 miles; so that if the above statement be correct, it appears that the insect has traveled about 360 miles in six years, or at the average rate of sixty miles a year. At this rate of progress it will reach the Atlantic in about fourteen years.

"It may perhaps be worth stating here, that my own experience is that these insects prefer the egg-plant to the potato, and it is well known that they prefer the potato to the tomato. Now the egg-plant is botanically more closely related to the *Solanum rostratum*, on which this insect feeds in Colorado, than is the potato, the two former being covered with thorny prickles and the latter being smooth; and on the other hand the potato is much more nearly related to the *Solanum rostratum* than is the tomato, which last has by modern botanists been removed from the genus *Solanum* and placed in a genus by itself. It would seem, therefore, that the closer a plant comes to the natural food-plant of the insect, the better the insect likes it.

"Dr. Fitch in his article on this insect, published in the *Transactions of the New York State Agricultural Society* for 1863, (pp. 796–801), says, 'it has fallen upon the potato-vines in numerous places *all over the North-Western States*,' and Mr. Cyrus Thomas, as quoted by Dr. Fitch, says that 'it was found in abundance in *Southern Illinois*' previous to 1861. But both these gentlemen confound together two perfectly distinct, but very closely allied species, the *Doryphora juncta* of Germar and the *Doryphora* 10-*lineata* of Say, one of which was really found in South Illinois previous to 1861, while the other was not, and one of which has never been known to attack the potato while the other habitually does so. The former of these was first described by Germar in 1824 from specimens which he had received from Georgia, and was also received by Dr. Le Conte from the same State ten or twelve years ago. In 1854 Dr. Helmuth, of Chicago, took this same species near Cairo, Ill.; and in 1861, Mr. Chas. Sonne, of Chicago, captured very numerous specimens of it in Effingham Co., Ill., on hickory bushes, which they appeared to him to be feeding on. The latter species, which is the true potato bug, was never taken by any one, so far as I can find out, east of the Mississippi river till 1864, and was first discovered by Say in 1823 in the regions bordering on the Upper Missouri river, and is quoted by Dr. LeConte and Rogers as being peculiar to Texas, Kansas and Nebraska.

"So closely indeed do these two insects resemble one another at first sight, that the Melsheimer Catalogue in 1853, and probably Thomas Say in 1824, considered them as mere varieties of one and the same species. Yet each has its own peculiar characters—each was originally confined to a distinct region of country—and one of them, at all events, and probably both, are limited to a distinct botanical family of plants and can feed on no other.

* * * * "The question whether the species that destroys potatoes has existed for an indefinitely long time in Illinois, or whether it has within the last few years migrated thither from the Rocky Mountain Region, may seem to some of merely theoretical interest. It is, however, of great practical importance. On the first supposition, it is not probable that it will travel eastward; on the second supposition it will most likely invade Indiana and Ohio within a few years, and finally pass on to the Atlantic States.

"The new Potato-bug is not what naturalis's call a *Bug*, but a true *Beetle*, belonging to the Order *Coleoptera* or *Shelly-wings*, and is rather more than one-third of an inch long, of so short an oval shape as to be almost as round as a grape, and cream-colored, with ten black lines or stripes placed lengthwise on its back. Its wings are rose-colored, and present a beautiful appearance as it flies. We may call it in English the "Ten-striped Spearman," which is the meaning of the scientific name given to it. The above is the appearance presented by the perfect or winged insect, when its wings are hid under its wing-cases; but in the larva or immature state, it is a soft, elongate, 6-legged grub, of a dull venetian-red color with several black spots, but without any wings, of course. There are four or five successive broods of them during the summer, and the larva of each brood goes underground to assume the pupa state. C. V. R., in the *Prairie Farmer* of August 8, 1863, who was the first to watch this insect through all its states, says that his specimens 'hatched on the 14th of June, and came out as perfect insects on the 10th of July, thus being scarcely a month going through all their changes.' He confirms the conclusion at which I arrived in July, 1862, in the columns of the *Valley Farmer*, that the larva always goes underground to transform.

"The insects commonly called "Potato-bugs," that have from time immemorial infested the potato throughout the United

States, are also Beetles like the "Ten-striped Spearman," but otherwise are in no wise related to it, being true blistering-beetles, belonging to the same genus as the common "Spanish-fly," of the shops, and raising just as good a blister as that does. Of these last, there are three distinct species which have been known to attack the potato, one of a jet-black color (*Lytta atrata*), one of a gray color (*Lytta cinerea*), and one of a yellow color, with four or six black stripes placed lengthwise on its back (*Lytta vittata*). Careless observers might confound this last with the "Ten-striped Spearman;" but the latter always has *ten* black stripes on its back; neither more nor less, and the former never has more than *six*. Besides, the whole shape and structure of the two insects is as different as that of a horse is from that of a hog. There is this essential difference, likewise, between the habits of the two, that the blistering beetles only feed on the potato in the perfect or winged state, whereas both the larva and the perfect beetle of the "Ten-striped Spearman" feed thereon, thereby, of course, injuring the vines to a much greater extent.

There are several species of lady-birds (*Coccinellidæ*), which destroy the eggs of this insect; and as the eggs laid by many of these lady-birds are of the same shape and color as those of the "Ten-striped Spearman," and are scarcely distinguishable but by their smaller size, being attached in the same manner to the leaf, care must be taken by those who undertake to destroy the eggs of the Potato-bug, not to confound those of their best friends with those of their bitterest enemies. The eggs of the "Spearman" are yellow, over 16th of an inch long, cylindrical, rounded at each end, and more than twice as long as wide, and they are attached by one end in clusters of 20 or 30 to the under surface of the leaf. It appears that in some localities a true Bug, belonging to the *Scutellera* family, and similar to the large, stinking Bugs often found on raspberries and blackberries, destroys the "Spearman" while it is in the larva state, by puncturing it with its long beak and sucking out its juices. And Mr. Shimer, of Carroll Co., Ill., finds that it is attacked in the same way, while in the larva state, by another cannibal Bug with its legs beautifully banded with black and white, (the *Harpœtor cinctus* of Fabricius), of which he has sent me specimens, and which I have myself noticed preying on a great variety of other insects.

"Almost the only remedy, hitherto, found to be effectual against the depredations of the "Ten-striped Spearman," is hand-picking them, either in the egg, larva or perfect state, or shaking the larva and perfect beetles off the vines into shallow pans; for which purpose a tin pan with a lid similar to that of a common spittoon would probably be found very convenient, as the insects might then be shaken through the centre hole from time to time, as they fell into the pan, and thereby be prevented from escaping. Dusting lime, ashes, &c., upon the vines has been found to be perfectly useless, and both coal oil and turpentine have been tried as preventives, and in the words of Mr. Hazen, of Nebraska, proved to be "no more use than so much water, as they soon evaporate." Mr. Orrin E. Priest, of Mosinee, Wis., however, has found that "turkeys are a perfect remedy for the potato-bugs;" and as the old-fashioned potato-bugs are deadly poison, and could not be eaten by turkeys with impunity, it seems to follow that his experience must relate to the Rocky Mountain insect, and consequently that this had already in 1865 made its way not only into Illinois, but also into Wisconsin. "I had," he says, "a patch in my garden literally covered with the bugs, which was all cleared off by turning in the turkeys three or four times. Also a piece in the field, in which I turned a turkey with a brood of young; and there they have kept them all off, and to-day there is no sign of a bug to be seen." (*N. Y. Sem. Tribune*, Aug. 29, 1865). Turkeys have from time immemorial been employed occasionally for "worming" tobacco, the objection to which practice is that they injure many tobacco-leaves. As the same objection will not apply in the case of the potato, they may probably be found very useful assistants in combating the "Ten-striped

Spearman." At the first sight we might suppose that common fowls would answer an equally good purpose; but I am told by those who have tried the experiment, that they are comparatively inefficient.

"Rock Island, Illinois, Sept. 23, 1865."

THE ARMY-WORM.

This insect,—*Leucania unipuncta*, of Haworth,—is sometimes very destructive to various crops. Its visitations are in some respects peculiar—it frequently appearing in great numbers in certain districts, and in its *march* destroying all kinds of grain and grass, for one season, and then suddenly vanishing for several years. Perhaps all the causes of its sudden disappearance from places where it has abounded for a season, are not known; but an important cause, probably, is that it is attacked and destroyed by parasites, several species of which have been discovered. Why these enemies of the army-worm do not always keep it in check and prevent its appearance in such vast numbers as are sometimes seen, is a question not easily answered. There is no doubt that the insect annually breeds in many localities where it does not attract notice, not being sufficiently numerous to do much damage. Whether it is practicable to foretell its appearance in unusual numbers, I do not know. The moths were quite plenty in the neighborhood of Lansing in August last, and it has been stated that the worms were seen on the early fall-sown wheat in the southern part of the State.

HISTORY AND CHARACTERISTICS OF GALLOWAY CATTLE.

The breed of cattle known as the Galloway, may be said to be indigenous to a section of country known by that name, in the southwest of Scotland, embracing the counties of Kirkcudbright, Wigton, and portions of Dumfries and Ayr. It is a breed of great antiquity, and on account of its various excellencies is sedulously preserved in its purity, and is not likely to be displaced by any other in its native district. Of its origin little can be said. It bears considerable resemblance to the breed of the Hebridean islands,—commonly called the West-Highland breed,—the most striking difference being that the Galloways are without horns and the Highlanders are horned. There is to be sure, considerable difference in size,—the Galloways being larger,—but this is readily accounted for from the more favorable circumstances under which the latter are reared. The characteristics of the Highlanders are so marked and distinct, that they have been taken as the type of a family of the ox tribe, and some writers consider the Galloway as merely an offshoot from the original stock, modified by the influences of climate and food.

Others attempt to trace the Galloway to what is supposed to be the remnant of a wild race,—*Bos scoticus* of some writers,—kept for many years past in the old Cadzow or Chatelerhault Park, belonging to the Duke of Hamilton, Lanarkshire, Scotland. These cattle, like those kept in Chillingham Park, Northumberland, England, are in a semi-wild state, though they have been for hundreds of years restrained in their liberty by fixed bounds. There has been much speculation in regard to these cattle. By some persons they are considered as descendants of the aboriginal stock of the country; others believe them to belong to a domesticated race introduced by the Romans nearly two thousand years ago, but which, being allowed to roam at will in the uncultivated districts of the country, became wild.

But it is proper to observe that from all the knowledge we possess of these cattle, there has always been a marked difference between the two herds of Chillingham and Chatelerhault. The former are uniformly horned, and except, in their color,—white with red ears,—bear a striking resemblance to the Devon breed. The Scottish "wild kye," as they are called, are larger than the Chillingham cattle, and there have always been polled or hornless ones among them. The color of the two herds is not the same. Though that of the Scottish herd may be said to be generally white, it is not so clear a white as that of the Chillingham stock, and instead of red muzzles and ears, those of the former are black, their tongues are black, and they are usually flecked with black on the forearm and lower part of the shoulder. Some of the earlier accounts of them, state that the cows were generally without horns and the bulls frequently so. The number of hornless ones seems to have decreased of late, probably from the fact that horned bulls only have been kept for propagation. Still, when the writer examined this herd, consisting of about eighty head of a breeding age, a few years since, several polled cows and one steer were noticed. The aged bulls had horns of medium length and size. As to color, it may be said to be somewhat variable, calves that are "off the markings" being not unfrequently produced. The keeper informed me that there were every season, some calves of a spotted black and white, and occasionally those of a wholly black color. These are always killed at an early age. It is contended by some that these out-croppings of black, as well as the absence of horns, indicate an affinity between this stock and the Galloways—the color of the latter being almost uniformly black, of late years, though it was formerly varied with red and brindled, and on some animals with patches of white.

That part of Cadzow Park in which the wild cattle are kept, embracing about one thousand acres, is called "The Oaks." On it are numbers of ancient oak trees, of massive size, and of an age computed at about one thousand years. They are regarded as the remains of the old Caledonian Forest, which according to early records once covered a great extent of country. In remote times, as tradition and history inform us, wild cattle ranged this forest unrestrained. Sir Walter Scott, in an unfinished poem, descriptive of Cadzow Castle and its surroundings, as they appeared in former days, alludes to the noble, but somewhat perilous sport, of hunting these cattle, as follows:

> "Mightiest of all the beasts of chase
> That roam in woody Caledon,
> Crushing the forest in his race,
> The mountain bull comes thundering on."

But it is impossible to say how far the Galloway cattle are allied to this semi-wild race. There is no doubt, however, that they are a very old breed. It is true that some writers speak of *horned* cattle having occupied portions of the Galloway district many years age; but the most reasonable inference from this fact is merely, that the polled breed has supplanted a horned one. Culley, in his "Observations on Live Stock," written in 1783, speaking of the Galloways, says:

"I found that the generality of breeders were against crossing with Mr. Bakewell's, [alluding to experiments in crossing the Galloways with the Bakewell Long-horns,] or any other kind of cattle, believing that their *original polled breed* had already been injured from crossings. Though the generality of their cattle are polled, yet they have those with horns, which they say are a bastard or mongrel breed from crossing with Long-horned bulls from Westmoreland and Cumberland. They prefer the polled ones, and of these the black or dark-brindled ones, to any others; and *allow them to be the original breed of the country.*"

The Galloway breed belongs rather to the mountains than the plains, though the district which they occupy in Scotland may be said to be intermediate between the Highlands, and the warmer and more fertile Lowlands. In hardiness and ability to stand rough weather and rough fare, they are excelled by no cattle, except the West-Highlanders. Their hides are thick, but mellow and elastic; their hair is very thick and much longer in winter than that of the English and most other breeds. Thus they carry a natural protection of which cattle belonging to milder climates are destitute. They are seldom sheltered in Scotland, although the frequent cold storms of winter could scarcely be endured by cattle of ordinary constitutions. Obliged as they often are, to sustain themselves through the most inclement season of the year, on coarse and frost bitten herbage, occasionally covered with snow, they are sometimes reduced to a low condition at the beginning of spring; but they improve very rapidly as the new grass comes on, and soon become fit for the butcher.

It may be here remarked that a very erroneous idea prevails in this country in regard to hornless cattle in general. Many people insist on calling every "muley," or no-horned cow or ox, a *Galloway.* They seem ignorant of the fact that there are several breeds of hornless cattle. In Scotland there are, besides the Galloway, the polled Angus and Aberdeenshire. These, however, have more or less affinity with the Galloway, though the latter is always placed in a separate class at the shows. In England there are the Suffolk and Norfolk polled breeds, and there was formerly the polled Yorkshire, a variety having in most respects the chief characteristics of the old Yorkshire Short-horns. In this country polled cattle are frequently seen which, except in the absence of horns, have few or none of the points of either of the varieties above named, though they generally have more resemblance to the Suffolk or polled Yorkshire than to any other. Specimens of these last named breeds were several years ago imported to this country.

In regard to the question sometimes asked, whether the Galloway should be considered the parent of all the polled varieties except the wild cattle of Cadzow Park, we may say that it does not seem probable. At least, there must have been a very great degeneracy in some polled stock, if it ever sprung from the Galloway.

As showing the points and qualities of the Galloway breed, the following British authorities are referred to:

"They are," says Youatt, "straight and broad in the back, and nearly level from the head to the rump. They are round in the ribs, and also between the shoulders and the ribs, and the ribs and the loins. They are broad in the loins, without large projecting hook [hip] bones. In roundness of barrel and fullness of ribs they will compare with any breed, and also in the proportion which the loins bear to the hook bones or protuberances of the ribs. Rev. Mr. Smith, author of the survey of Galloway, says: 'When viewed from above, the body appears to be beautifully rounded like the longitudinal section of a roller.' They are long in the quarters and ribs, and deep in the chest. The slightest inspection will show that there is less space between the hip and hook bones and the ribs than in most other breeds—a consideration of much importance, for the advantage of length of carcass consists in the animal being well ribbed home, or as little space as possible lost in the flank.

"The Galloway is short in the leg, and moderately fine in the shank bones—the happy medium seems to be preserved in the leg, which secures hardihood and a disposition to fatten. With the same cleanness and shortness of shank, there is no breed so large and muscular above the knee, while there is more room for the deep, broad, and capacious chest. He is clean, not fine and slender, but well proportioned in the neck and chops; a thin and delicate neck would not correspond with the broad shoulders, deep chest, and close, compact form of the breed.

"The Galloway is covered with a loose, mellow skin of medium thickness, and which is covered with long, soft, silky hair. Even on the moorland, where the cattle, during the greater part of the year, are fed on the scantiest fare, it is remarkable how little their hides indicate the privations they endure."

In regard to the purity and fixed character of the breed, the same writer observes: "There is, perhaps, no breed of cattle which can more truly be said to be indigenous to the country, and incapable of improvement by any foreign cross, than the Galloway."

A similar remark is made by Prof. Low. "The breed of Galloway," he says, "is peculiarly confirmed in its character, and thoroughly adapted to the condition of the country. * * * It would be a retrogradation in improvement to atttempt a mixture of blood with a race so long acclimated, and so excellent in itself, as that of Galloway. The great advantage of having a breed possessing a uniformity of characters, is manifest in Galloway, as in every country where a fixed race with determined characters exist. The breeder has always, in such a case, the assurance of being able to reproduce in the offspring, the character of the parents; whereas, in countries where no uniform breed has been established, he never can be so assured of the result of coupling animals together. The cattle of Galloway, though they have all the characters of resemblance which constitute a distinct breed, yet vary greatly in size, according to the fertility, natural or acquired, of the farms on which they are reared, showing the importance of providing an increase of food for the animals when growing in bone and muscle."

It is easy to understand, bearing in view the characteristics of the Galloways, as above described, why all attempts to improve the breed by crossing it with others, have proved unsuccessful. Allusion has already been made, in a quotation from Culley, to a cross tried with Bakewell's variety of the Long-horns, and it appears that at a later day similar trials were made with the Short-horns. Prof. Low, in allusion to these trials, says:

"Efforts have, from time to time, been made to cross the Galloways by the Dishley Long-horns, the Ayrshires, and the modern Short-horns. These attempts, it is believed, have all been failures, in so far as they were designed to improve the general breed of the country; and modern breeders, with better knowledge, have turned their attention to the improvement of the existing race."

Youatt, in reference to the same subject, remarks that the Short-horns have, in many instances, improved the stock of districts where they have been introduced, but have failed in Galloway. "They have," he says, "at least in the first cross, produced manifest improvement, although the advantage has not often been prolonged much beyond the second generation; but even in the first cross the Short-horns have done little good in Galloway, and as a permanent mixture the choicest southern [Short-horn] bulls have manifestly failed. The intelligent Galloway breeder is now perfectly satisfied that his stock can only be improved by adherence to the pure breed, and by care in selection."

Lawrence, whose "Treatise on Cattle," was written about the commencement of the present century, observes: "It is not improbable that there were only two original species [breeds] of neat cattle in Scotland, those common to the islands and the mountain country, called Kyloes [or West Highlanders], in color, black, brindled, dun, red—the black being the favorite color in Scotland—and the polled breed, chiefly confined in later times to the district of Galloway, and known by that name. The former the smallest and most hardy breed known in this island [Great Britain], and apparently the same with that of the more northern countries, may be seen at this day in its original purity, no motive existing for crossing a breed so perfectly adapted to the severity of the climate and scarcity of keep. The original polled cattle were of the same colors, but more varied, and considerably larger in size.

"Amongst the common run of Galloway cattle, we sometimes find them white-faced and pied, with small grizzly horns, undoubtedly from a mixture with Dutch or English Short-horns; but this cross is said to detract twenty per cent. from the worth of a beast. As to form, the true Galloways are broad in the shoulders, long and round bodied, yet deep, straight, and broad on the back, with a thick, shaggy coat; the legs of middling length, with large feet."

The "British Husbandry," vol. 3, under the head of Reports of Select Farms, gives a report on the "Netherby Farm," in the county of Cumberland, a hilly and mountainous district. The report, which was drawn up by the superintendent of the farm, states that the Galloways are the cattle preferred there, after repeated trials with several other breeds, including the best improved short-horns, "*of the stock of Messrs. Colling, and other celebrated breeders.*" Of the Galloways it is said: "They possess many advantages, as they can at any time be brought to market. Their hardy and very healthy habits fit them well for the climate and soil of Cumberland; and although the cross with the short-horn does produce a good beast, no good breeder would choose to continue his stock from these crosses."

Mr. Stephenson Scott, formerly of Washington, D. C., a gentleman distinguished for his knowledge of stock, and author of a series of very interesting letters published several years since in "Skinner's American Farmer," with the signature of "Albion," has spoken highly of the Galloway cattle in a communication headed "Provisions for Exportation," published in the Report of the Commissioner of Patents for 1844. Mr. Scott had been, in England, a breeder of Herefords, to which he gives the preference over any of the *English* breeds, as *beef cattle*, but in concluding his article, he observes: "I am inclined to think that some of the Scotch cattle are better calculated for our country than any of the large English breeds, and particularly the best polled Galloway cattle. They, like their countrymen, are hardy and thrive almost everywhere; and these cattle are large enough for all purposes and pastures."

The London "Farmer's Magazine," in an article describing the show of the Highland Agricultural Society at Dumfries, in 1860, says: "The Galloways, as a distinct race, are by far the oldest breed of stock in the United Kingdom, tracing back, pure and unalloyed, even so far, it is affirmed, as the commencement of the seventeenth century. They look, too, just the animals for a rough, bleak district; long, low, and active, with rough, black and tan coats, and plenty of thick, curly hair. The bulls have somewhat bullet 'nigger' heads, with every sign of vigorous constitution, and thorough capability to cope with the climate. But the Galloways die well for the butcher, and many of those exhibited at Dumfries had fed and furnished as even as could be. The symmetry of outline was, in many animals, very perfect, and whether they have been *improved* up to their present form, or have only kept to it, there is no kind of beast the Highland Society should be more careful in encouraging. Not, however, that the necessity for any such official countenance is very imperative; the farmers of the district have been very true to them, and 'the sign' they made on Wednesday showed how much good stock they must have to fall back upon."

The flesh of the Galloways is of very fine quality, and commands a higher price per pound in the markets of England and Scotland than that of any other breed, except the West Highlanders and the cattle of the Shetland islands. From the cylindrical form of the carcass, the "Galloway rib" is well known in the London market. Culley, to whom reference has previously been made, remarks of the Galloways: "Few or no cattle sell so high in Smithfield [London] market, being such nice cutters up, and laying the fat on the most valuable parts; and this is a great excellence in all feeding cattle. It is no uncommon thing in this refined market, to see one of these bullocks outsell a coarse Lincolnshire ox, though the latter may be the heaviest by several stones weight. I was told by a Lincolnshire grazier that a Lincolnshire bullock and a Scotch bullock, sent from the same village at the same time, were sold for exactly the same money, though the Scot was only half the other's weight."

The trade in stock from the district of Galloway has been very extensive for more than a hundred and fifty years, large numbers of cattle being annually sent to the English markets. Prof. Low says: "It is computed that upwards of 20,000 head are annually exported from the district. Their average dead weight at three years old may be reckoned at 45 stones of 14 lbs. to the stone [630 lbs.]; those sent to London weigh from 55 to 60 stones [770 to 840 lbs.]." These weights are for the four quarters, or meat only.

It will be admitted that these are good weights for three-year-olds, many of which are only grass-fed. Selected and well-fed specimens of the breed of course attain a much greater size. Youatt gives an account of a Galloway heifer called "Queen of Scots," bred by Mr. Mure, of Grange, near Kirkcudbright. The following were her proportions: height at the shoulders, 5 feet 2 inches; length from nose to rump, 10 feet 4 inches; width across the hips, 2 feet 6 inches; across the middle of the back, 3 feet; across the shoulders, 2 feet 4 inches; girth of leg below the knee, 8 inches; distance of breast from the ground, 1 foot 3½ inches; width between the fore legs, 1 foot 5 inches. Her dressed weight at four years old, was 1,520 lbs. She was exhibited at the Smithfield Show, and her portrait engraved under the sanction of the Club.

But even this fine animal has lately been excelled by another specimen of the breed. This was a heifer bred by the Duke of Buccleugh, and fed and exhibited at several shows by Mr M'Combie, of Tillyfour, Scotland. She was first exhibited at the Birmingham Fat Stock Show, in 1861. She was then four years and ten months old, and her girth, though said not to be her strongest point, was 8 feet 9 inches. She took, on this occasion, the prize of £10, as the best Scotch cow or heifer; the Gold Medal as the best of all the cows and heifers; the Silver Cup of 25 guineas as the best beast in the yard; Simpson's cup of 50 guineas as the best animal fed on his cattle-food; and the Silver Medal to the Duke of Buccleugh, as her breeder. The week following she appeared at the show of the Smithfield Club—which for a period of nearly seventy years has been the greatest fat stock show in the world—where she took the first prize of £10 as the best Scotch polled cow or heifer, with another silver medal to the breeder. At this show a Short-horn cow, which she had beaten at Birmingham, was placed before her—an act which was strongly censured by the press and public opinion. The Galloway went on to France, and at the International Show of Fat Cattle at Poissy, she took the first prize of £40 and the Gold Medal as the best cow or heifer in the Scotch class of polled cattle. She was afterwards sold to a Paris butcher—Mr. M'Combie realizing for her, by sale and in prizes, a sum equal to a thousand dollars or more.

When this heifer was at Birmingham, she was spoken of by a writer for the Farmer's Magazine, as a "wonderful" animal, "almost on every point, perhaps, as perfect a fat animal as ever was shown. Short on the leg and deep in the frame—wide before and square behind, long in the quarter, and famously let down to her very hock—with a fine countenance and expressive eye—a beautiful coat and the most mellow of touches."

After Mr. M'Combie's success with this heifer, and a similar triumph with a polled Aberdeenshire ox, a public dinner was given him in Aberdeen, "in acknowledgment of his eminence as a breeder and feeder of the black polled cattle." In some remarks made on this occasion, Mr. M'Combie said:

"I was led by a father whose memory I revere, to believe that our polled cattle are peculiarly suited to our soil and climate, and that if their properties were rightly brought out, they would equal, if not surpass, any other breed as to weight, symmetry, and quality of flesh. I resolved that I would endeavor to improve our native breed. I have exerted all my energies to accomplish this purpose. For many years I was an unsuccessful exhibitor at the Smithfield Club Shows. I went to Baker street, [in London, where these shows were for some years held] I minutely examined the prize winners; I directed my attention especially to the points in which the English were superior to the Scotch cattle. I came to the conclusion that I had been beaten, not because our Scottish breed was inferior to the English breeds; I saw that I was beaten because I was imperfectly acquainted with the points of the animals most appreciated in Baker street, and the proper system of feeding them. I selected the animals best fitted for exhibition at Baker street, and attained the object of my ambition. The English agriculturists always maintained that a Scot would never take the first place in a competition with a Shorthorn, a Hereford, or a Devon; I have given them reasons for changing their opinion. A polled Scot, exhibited by me, took the first place at Birmingham. To a polled Scot, exhibited by me, the Prince Albert Cup was unanimously awarded, at the late Great International Show in France, by a jury of twelve, consisting of English, Irish, and French gentlemen, in a competition with the finest oxen of the English and French breeds."

In regard to the size of breeding animals of the Galloway breed, I may mention that at a show of the Highland Society, held a few years since, in the city of Edinburgh, I took the girth of several Galloways, and that a bull two years and four months old measured seven feet two inches; another, four years and four months old, seven feet and nine inches. These were the first-prize animals in their classes, were well shaped in every respect, and heavy in proportion to their girth. A Galloway bull, bred by Mr. John Snell, of Edmonton, Canada West, weighed, alive, at two years and five months old, 1,830 lbs. Another, bred by the same gentleman, now owned by the Michigan State Agricultural College, weighed, at eighteen months old, 1,480 lbs.

It will be inferred from what has been said, that the leading excellencies of the Galloways consist in their superior value as fattening stock. The cows are not remarkable for the quantity of their milk, but it is very rich, and affords a comparatively large proportion of butter, of the finest quality. Youatt says a cow may average "six or eight quarts per day during the five summer months, after feeding her calf," and that during the next four months she may give half that quantity, running dry the remaining three months of the year. According to this, we may assume that the average for the first five months would be seven quarts per day, and for the next four months, three and a half quarts per day; which would give, as an annual product, 1,470 quarts, besides supporting the calf.

From some experiments made on the milk of cows of different breeds on the "Crown Estate," at King William's Town, Ireland, a summary of which was published in the Journal of the Royal Agricultural Society of England, Vol. IV., it appears that an average of nine and a half quarts of the milk of the Galloways produced a pound of butter. This would give, as the average annual product from the quantity of milk above mentioned, 154 pounds of butter, an amount which is believed to be far greater than the average product of cows in this country, and exceeded only by well-selected and well-kept herds. But this average product for the Galloways is for the milk they yield *besides supporting the calf;* and to give some idea of the quantity which is used for this purpose, it is proper to refer to accounts which describe the manner of raising calves in Galloway. Youatt says:

"The calves are reared in a manner peculiar to Galloway. From the time they are dropped they are permitted to suck the mother, more or less, as long as she gives milk. During the first four or five months they are allowed, morning and evening, a liberal supply; generally more than half of the milk of the cow. The dairy-maid takes the teats on one side, while the calf draws the milk at the same time, and exclusively, from the other side. When the calf begins to graze a little, the milk is abridged by allowing the calf to suck only a shorter time, and he is turned upon the best grass on the farm. In winter he is uniformly housed during the night, and fed upon hay, with a few turnips and potatoes; for the breeder knows that if he is neglected or stinted in his food during the first fifteen months, he does not obtain his natural size, nor does he feed so well afterwards."

When it is recollected that *half the milk* of the Galloway cow in her native district, for four or five months after calving, is taken for the support of the calf, the quantity she must afford during the year is far from being small, and a fair estimate for the quantity of butter which all her milk would yield in the year, could not be less than 200 pounds—a quantity only equaled by our best dairies with the best management. It should be borne in mind, too, that this product refers to what the stock does in a rough and not fertile country. Upon a fair view of the case, therefore, the conclusion must be adopted that no breed fitted for such a situation would be likely to do better there than the Galloways, even for dairy purposes.

Mr. Snell, of Edmonton, C. W., to whom allusion has before been made as a breeder of Galloways, keeps both this breed and the Short-horns—about thirty head of each. His Galloway and Short-horn cows run together, and he states that the *quantity* of milk given by the two breeds is about equal, but that the milk of the Galloways is much richer.

Considering the characteristics and the long-established repuation of the Galloway cattle, it seems singular that they were not long since introduced into the United States. There can be little doubt of their adaptation to the northern portion of the country. Our Canadian neighbors, many of whom were emigrants from Scotland, evinced a better appreciation of the value of this breed, and some twelve years since, introduced specimens into the Upper Province. Their adaptation to the country, and their obvious merits, have caused them to increase and spread rapidly. At the late Provincial Show, at London,

C. W., there were no less than seventy entries for Galloways, and ten entries for the polled Angus.

Persons acquainted with the Galloways have been of the opinion that they would be a highly useful stock for portions of our country. The late Felix Renick, Esq., a gentleman distinguished for his judgment in regard to cattle, and who was the agent for the purchase of Short-horns for the Ohio Stock-Importing company, 1836, more than once stated to the writer of this article, that had his object been to procure the best cattle for the Northern States, he would have taken the Golloways and West Highlanders. I think no good judge, who has had the opportunity of studying these cattle in Scotland, can fail to see their adaptability to our wants.

B. P. Johnson, Esq., the well known Secretary of the New York State Agricultural Society, who has had ample opportunities for examining the stock of Britain, speaking, several years since, of the Galloways in reference to their introduction into New York, says: "There is no doubt of their adaptation to many portions of this State, as well as to the Northern States generally. Their aptness to fatten is such that they would, at comparatively little expense, be fitted for market, and the superiority of their beef is well understood by every one acquainted with the London market; and if introduced here, they would doubtless, become equally popular. I was asked by a distinguished breeder in this State, which among the various breeds of cattle in Great Britain, I considered best adapted to the Northern States. I answered that, if it was left to me to select, I would have no hesitation in choosing the Galloways and West Highlanders."*

Yet it is only within a short time that any of the pure Galloway breed have been introduced into the United States. Hon. Ezra Cornell, of Ithaca, New York, having seen specimens of the breed at the combined show of the English Royal and Scottish Highland Agricultural Society, at Battersea, near

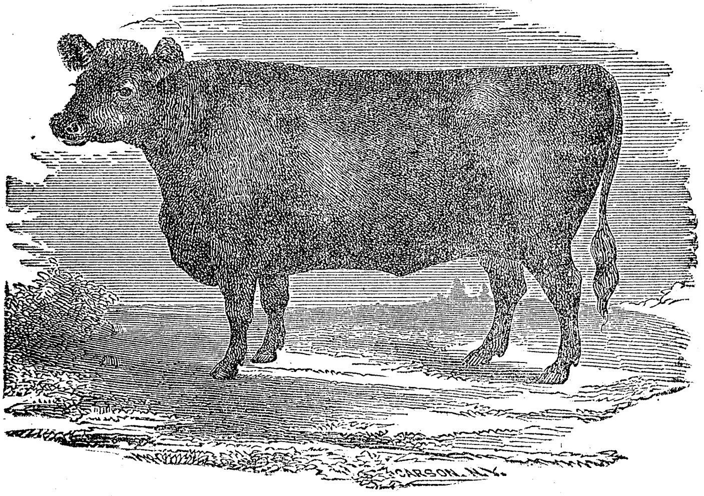
---

*Transactions New York State Agricultural Society, for 1846, page 292.

London, in 1862, was so much pleased with them, that he has since imported some. Under date of Nov. 30th, last, he writes: "The Galloways which I saw at Battersea were most beautiful animals, and carried all the points of thrifty, good feeders. I have a bull, two cows, and a heifer calf—all fine animals."

The Michigan State Agricultural College purchased of Mr. Snell, in September last, the young Galloway bull "Victor," to which allusion has before been made, and a fine two year old heifer. They are doing well at the College Farm. If, on being subjected to a fair trial, they prove as well as may reasonably be expected, it is to be hoped that the introduction of these specimens, will lead to the establishment of the breed in this State.

The figure of a Galloway bull, which forms the frontispiece to this report, is a portrait of one owned by the Duke of Buccleugh,* which obtained the first prize of his class at the show of the Highland Agricultural Society in 1845. The animal was four years old. The original engraving appeared in the (London) Farmers' Magazine.

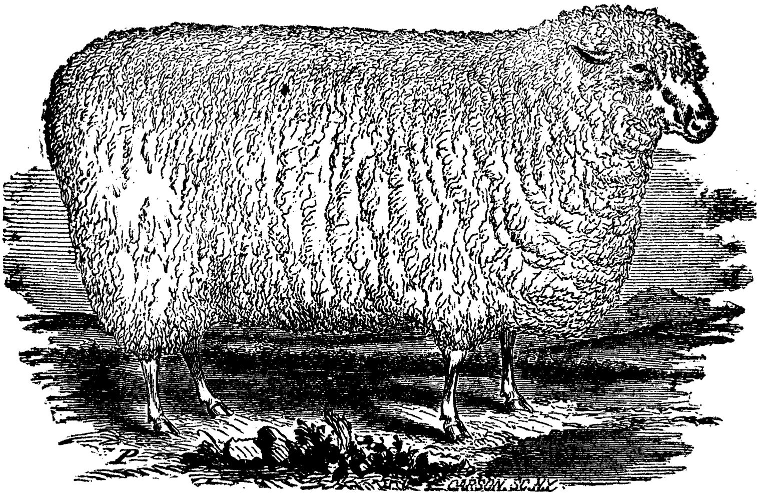


---

*It will be observed that this nobleman was the breeder of the famous heifer fed by Mr. M'Combie, described on a preceding page.

As further illustrating the points of the breed, the figure of a heifer is given, taken from the complete Grazier. It shows what would be considered in Scotland, a good (not extraordinary) specimen of the Galloway breed, in such condition as the stock usually is after a fair run at grass. The fine symmetry of the animal, especially the roundness of the carcass, and the evenness with which the flesh is laid on, together with an appearance of great constitutional vigor, is well shown in the cut

THE COTSWOLD BREED OF SHEEP.



From time immemorial a breed of sheep has occupied a range of hills called *wolds*, situated chiefly in the county of Gloucester, England. The term *Cotswold* under which the sheep are known, is said by British authors to signify a sheepfold and a naked hill. These folds, *cots* or *cotes*, were erected to afford shelter for the sheep,—the elevation and bleakness of the district requiring some artificial protection for the animals. Martin describes these structures as consisting of "not only rude huts or sheds, but of extensive ranges of buildings, of three or four stories, communicating with each other by means of gradual sloping ascents, or pathways, so that the sheep had no difficulty in ascending to the topmost story. Thus no room was lost, and the most efficient shelter was provided for the flock either by day or night, during the continuance of winter, or at the lambing season."

The old breed was held in such estimation that in the reign of Edward IV., in the year 1467, permission was granted for a number to be exported to Spain, where they were said to have greatly increased, and to have much improved certain Spanish sheep. From this fact the unreasonable idea has been entertained that these ancient Cotswolds were the parent stock of the Merinos. The more probable supposition is that the English sheep were either taken as the ground-work of a new long-wooled stock, or to improve some Spanish long-wooled breed.

Although authorities are somewhat conflicting in regard to the character of the Cotswold sheep in early times, there can be no reasonable doubt that they have always been a long-wooled breed. Markham, in the time of Queen Elizabeth, speaks of them as having long wool. Spooner (1844) says we have no evidence, either oral, written, or traditional, of a change having been made from short to long wool.

Martin speaks of the old Cotswolds as "a hardy race of sheep, big-boned and long-wooled, and well adapted to the hill-range which constitutes their stronghold. To judge from the relics still extant [1847], though not pure, they were flat-sided, deficient in the fore-quarters, heavy in the hind-quarters, slow-fatteners, and covered with a long and weighty fleece; this latter being variable in quality, but always truly valuable as a combing wool. But the old breed is now more or less modified, and though it has not merged into the Leicester, is in many points deeply imbued with the Leicester blood. In other parts, where hardiness is peculiarly essential, the cross has only been carried so far as to give those improvements which we have more than once detailed, as the invariable result of even a single cross with this peculiar strain."

Spooner says: "The Cotswold is a large breed of sheep, with a long and abundant fleece, and the ewes are very prolific and good nurses. Formerly they were bred only on the hills and fattened in the valleys of the Severn and Thames; but with the enclosure of the Cotswold hills and the improvement of their cultivation, they have been reared and fattened in the same district. They have been extensively crossed with the Liecester sheep, by which their size and fleece have been somewhat diminished, but their carcasses considerably improved, and their maturity rendered earlier. The wethers are now sometimes fattened at fourteen months old, when they weigh from 15 to 24 lbs. per quarter, and at two years old increase to 20 or 30 lbs. The wool is strong, mellow and of good color, six to eight inches in length, and 7 to 8 lbs. to the fleece.

"The superior hardihood of the improved Cotswold over the Leicester, and their adaptation to common treatment, together with the prolific nature of the ewes, and their abundance of milk, have rendered them in many places the rivals of the new Leicesters, and have obtained for them, of late years, more attention to their selection and general treatment, under which management still further improvement appears very probable. They have also been used in crossing other breeds. It is indeed the improved Cotswold that under the term New or Improved Oxfordshire sheep, are so frequently the successful candidates for prizes offered for the best long-wooled sheep at some of the principal agriclutural meetings or shows in the kingdom. The quality of the mutton is considered superior to that of the Leicester, the tallow being less abundant, with a larger development of muscle and flesh. We may, therefore, regard this breed as one of established reputation, and extending itself throughout every district of the kingdom."

It will be properly inferred from the foregoing remarks, that the modern Cotswold breed was derived from a cross between the old Cotswold and the improved Leicester, or Bakewell breed. They have, however, been so long bred with particular reference to a peculiar standard, that they have fairly assumed a type of their own, and they have for many years been propagated by carefully selecting the best animals of the stock—seldom resorting to the Leicester breed. In a

Prize Essay of the Royal Agricultural Society, on the Farming of Oxfordshire, 1854, the Cotswolds are spoken of as follows:

"These sheep are sometimes called Glo'sters and New Oxfords, but these are only different names for the same sort of sheep. * * * The Cotswolds are a hardy, heavy, and most useful breed of sheep; they are gradually and most deservedly rising in public estimation. The improvement which has been effected in these sheep within the last 20 years is surprising. They may be indebted to the Leicesters for diminishing their coarseness, producing more aptitude to fatten, and rendering the fleece of finer quality; but they have not lost their gigantic size or the hardiness which so fits them for cold and elevated situations. As a farmer's sheep they are much superior to any other long-wooled variety, producing great weight of mutton and a heavy fleece at a very early age. Tegs [yearling ewes,] at 14 months old, will commonly weigh 80 lbs. per sheep, and clip eight or nine pounds of wool. Numerous instances might be cited of much heavier weights; but the above may be taken as a fair average."

Robert Smith, in his report on the sheep exhibited at the Show of the Royal Agricultural Society, 1862, says of the Cotswolds: "They are certainly an improved race from their great-great-grandfathers. These animals have always had open enemies to contend with—wind and weather. They seem to have trampled over every obstacle, and bid defiance to the other breeds for weight of carcass, wool and quality combined. We will not venture to inquire how they are produced at so early an age, but content ourselves with the oft-told stories of 50, 60, and 80 lbs. per quarter, and from 10 to 18 lbs. of wool."

He gives the points of the Cotswold sheep, as follows: "A bold and commanding animal, with finely arched neck, broad, straight back, arched ribs, and length of quarter, carrying an enormous weight of carcass upon clean legs. * * * They were at one time not unfrequently called Gloucesters, but this name has now entirely merged into the one title of Cotswolds. The Cotswold ram is much sought after for crossing, especially with the Hampshire and Sussex Downs, thus producing a more rent-paying animal for intermediate localities."

In regard to weight of fleece, the late Mr. Druce, of Ensham, England, a breeder of the new variety known as Oxfordshire Downs, considered the average of tegs, or yearling ewes of the Cotswold breed, at from seven to ten lbs.; of older ewes, five to seven lbs. Mr. Lawes, of Rothamsted, in an experiment with 50 Cotswold wethers, 43 Leicesters, 40 Hampshire Downs, 40 Sussex or South-Downs, and 41 cross-bred wethers, found the weight of wool to be as follows:

Cotswolds,	9 lbs. $4\frac{3}{4}$ oz.
Leicesters,	8 lbs. 2 oz.
Hampshire Downs,	6 lbs. 4 oz.
South Downs,	5 lbs. 10 oz.
Cross-breds,	6 lbs. 7 oz.

The cross-breds seem to have been a mixture of Cotswold and Down. The age of the sheep is not mentioned. The proportion of wool to 100 lbs. live weight of carcass, at the time shorn, March, is stated as follows:

Cotswold,	5.44 lbs.
Leicester,	5.58 lbs.
Hampshire Down,	3.77 lbs.
South Down,	4.57 lbs.
Cross-breds,	*4.60 lbs.

It should be borne in mind that the English wools in the fleece, whether washed or unwashed, contain much less extraneous matter than Merino wool—the former, unwashed, only wasting, in scouring, from twenty to twenty-five per cent., against a waste of sixty-five to seventy-five per cent. in the latter.

The great increase of the Cotswold and other long-wooled sheep in England of late years, has been brought about in a great degree by the increased value of their wool. In the former use of long-wool it was combed by hand, a process so expensive as

---

*This is taken from a statement by Mr. Harris, formerly a pupil of Mr. Lawes, and late editor of the Genesee Farmer.

necessarily to make the goods into which it was wrought too costly to come into general use. About twenty years ago an English manufacturer by the name of Salt, invented machinery for working the fleece of the alpaca, and this caused a great demand for that staple. A modification of the same machinery that was used for working alpaca, enabled the manufacturer to use the English long-wool in combination with the former for the production of what are called alpaca goods, of a lustrous appearance. Further improvements in machinery and in the processes of manufacture, have caused the long lustre wool to take the place of alpaca to a great extent, in the production of so-called alpaca fabrics. The uses of long lustre wool have also been multiplied in other respects. Fabrics of silk and worsted have been greatly increased, especially in France, causing a great demand for English long-wool, at a high price. It was stated by Mr. Caird, in a paper read before the Council of the Royal Agricultural Society, in 1861, that no less than 58,000,000 lbs. of English long wool was taken by France and other continental countries in the year 1859. The demand for this article has been constantly increasing.

Within a few years, machinery for working long wool has been introduced into the United States, which has caused a demand for the raw material beyond the production of the country. We have resorted to the Canadas for a supply. The Canadian farmers, especially those of the Upper Province, have generally kept the English sheep. For some time the Leicesters, or high crosses of this breed, were quite common. Latterly the Cotswolds have been introduced and are increasing. The wool produced by these sheep has found a ready sale, at high prices, in our markets, under the name of Canada combing-wool. In the winter of 1864–5 it was sold in the eastern cities at from a dollar and twenty-five to a dollar and thirty-five cents per pound, and in one instance a considerable sale was made at a dollar and forty-five cents per pound.* The quotations of this wool in the Boston market have been about ten cents per pound higher, through the present year, than Michigan Merino.

---

*Letter of Taft, Weeden & Co., in the Monthly Report of the Department of Agriculture for February, 1865.

It must be obvious that the high prices for long wool, which will probably continue, will much increase the inducements for keeping the sheep which produce it in this country. Before these high prices for long wool were obtained, the long-wooled sheep were undoubtedly more profitable than the fine-wooled or Merino, near large markets, on account of the greater profits afforded by their meat. The effect of the rise in the value of their wool will be to enlarge their sphere—to cause them to be more extensively adopted. And another important tendency to this result, is the steady increase of the demand for mutton. The taste of our people for this meat is growing, as they have the opportunity of learning what *good* mutton is. The scarcity and high prices of beef and pork tend to the same result, by rendering it difficult for many people to obtain those articles.

Still, the proper localities for long-wooled sheep, are where there is the greatest demand for meat, and it would be unwise to adopt them where the carcass could not be readily sold at a fair price. The farmer, in the choice of a breed, should consult his circumstances—the condition of his farm, whether it will afford the proper support to large sheep, whether he can make ready sales of fat sheep, and last, but not least, whether he understands the peculiar habits of such sheep, and is fitted to bestow on them the attention requisite to their thrift and profit. It should be borne in mind that they are not suited to the treatment of farmers, who, in their selection of animals, are guided mainly by the principle of obtaining those which will bear the most abuse.

In the paper by Mr. Caird, before referred to, it was stated that many English long-wooled rams had lately been introduced into France, where they had been extensively crossed with Merino ewes for the production of long-stapled wool, in great demand in that country, as before observed, for particular fabrics. A similar use of long-wooled rams might doubtless be made with good results in this country. There is here a great demand for wool adapted to delaine goods. The best wool for this purpose is produced by an infusion of the blood of the English long-wooled sheep with Merino, or high grades of that breed. The establishment of a distinct class of delaine-wooled sheep is much wanted. They would be very profitable; for while the wool would bring a remunerative price, the fattening tendency imparted by the Cotswold, or other long-wooled breed, would make them valuable as mutton sheep.

The weights of Cotswold sheep, cited on a preceding page, are frequently exceeded. A correspondent of the (London) Mark-Lane Express, says they frequently reach the weight of 60 to 70 lbs. per quarter, and that fleeces weighing 20 lbs. are not uncommon. Wm. Cother, a well known breeder of Cotswolds, in a letter to the paper just mentioned, dated Dec. 4, 1851, says: "I happen to have two carcasses of mutton now hanging up of my own breeding, one 84 lbs. per quarter, the other 70¼ lbs. per quarter. These sheep I was oblighed to slaughter before the intended time. I have another sheep now alive, which appears to be much heavier." The editor of the paper makes the following notice: "Mr. Cother, whose letter on the subject of Cotswold sheep has most likely attracted attention, exhibited at a butcher's shop, just opposite the entrance to the Bazaar, a most extraordinary carcass of mutton, weighing no less than 336 lbs. The sheep was of the Cotswold breed, and three years and nine months old."

The Cotswold sheep have been introduced into the United States to some extent, but are not yet as numerous with us as with our Canadian friends. The Michigan State Agricultural College purchased of John Snell, of Edmonton, C. W., in September last, a yearling Cotswold ram and two yearling Cotswold ewes. The ram received the first prize in his class, at the Provincial Show, at London, C. W., and also took prizes at several local shows, at which he was subsequently exhibited.

He is a superior specimen of the breed—very perfect in form, with a heavy fleece of lustre wool, and of very large size for his age, having weighed, on starting for the Provincial Show, 305 lbs. The ewes are fine ones, and took a prize at the Provincial Show.

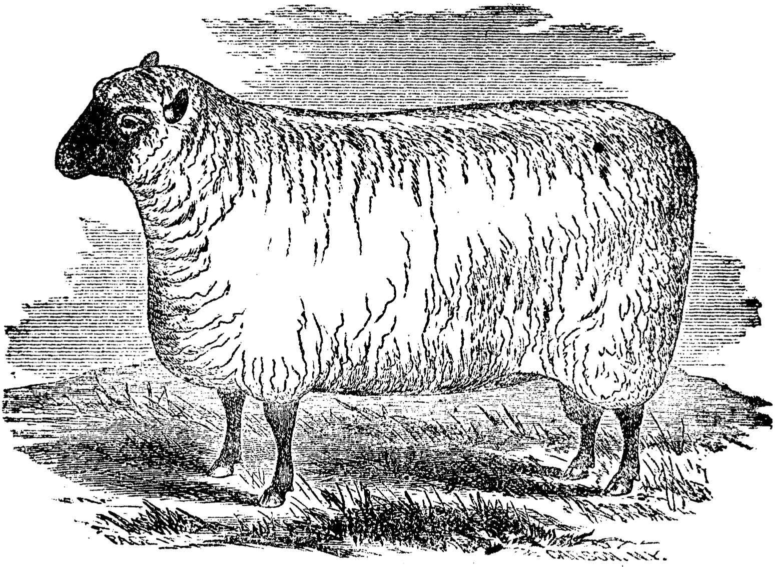
The figure of a Cotswold ram accompanying this article was taken from one bred by F. W. Stone, of Guelph, C. W., and formerly owned by H. G. White, of South Framingham, Mass. It affords a good illustration of the breed.

In concluding this article, it may be well to notice particularly a matter which has led to some confusion in reference to Cotswold sheep. It has already been mentioned in the extracts given from various authors, that these sheep have sometimes been called Glo'sters, and sometimes New Oxfords, but that the name has of late years been dropped, and no other than Cotswold, or improved Cotswold, applied to them in England. The late Charles Large, of Broadwell, Oxfordshire, was the first to apply the term New Oxfordshire to the improved Cotswolds. He was a breeder of considerable distinction, and seemed ambitious to give his own flock a peculiar title. Some twenty years since, C. B. Reybold, of Delaware, imported sheep from Mr. Large's flock, and called them by the name given by M. L. At a later period some few other persons in this country had sheep which they called by the same name. A man in Connecticut picked up sheep in various places, which, as they evidently belonged not to the Cotswold, nor to any other established breed, he called "New Oxfordshires." By this means he was enabled to sell to persons not well informed, sheep of no recognized breed, and of no particular character.

But the name of New Oxfords, or New Oxfordshires, would have long since gone out of use in this country as well as in England, if it had not been countenanced by some of our agricultural journals, and by other writers on sheep. Even in Randall's Practical Shepherd, a separate article is assigned to the "New Oxfordshire, or Improved Cotswolds," although in the author's arrangement of breeds, the Lincolns are placed between the so called New Oxfordshires and the Cotswolds.

If anything further is wanted to show the indentity of the quondam New Oxfords with the Cotswolds, it may be found in the following extracts from a letter of Mr. Cother (who has already been referred to in this article), to the Mark-Lane Express. He says: "It is true that the late Mr. Large styled his sheep the 'New Oxfordshire,' leading many persons to suppose that they were a new variety and not Cotswolds; this, however, was not the case, for they are really as much Cotswolds as those bred in Gloucestershire, for Mr. Large bred from Gloucester breeders, and they from him; so the terms were synonymous to all intents and purposes; and with his death the term died, too. I well recollect the late Mr. Hewer, of Northleach, lamenting this term as certain to lead to erroneous impressions."

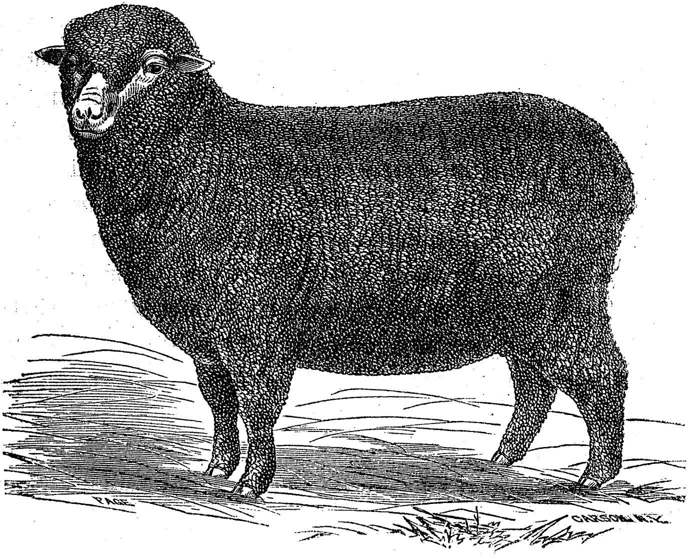
SOUTH-DOWN SHEEP.



The South-Down breed of sheep is one of the oldest in Britain. It has occupied a range of hills called *dunes* by the Saxons, and "downs" by the modern English, in the county of Sussex, England, from time immemorial. Great improvement has been made in the breed by the skill and judgment of various breeders, the first of whom, of special note, was John Ellman, who commenced his system of selections towards the close of the last century. His stock was taken by others, and improvement pushed still further. Among the later improvers were the late Duke of Richmond, and the late Jonas Webb. The latter gentleman eclipsed all his contemporaries, and established a flock of South-Downs which obtained world-wide celebrity. The Webb sheep excelled all others of the breed in size, symmetry, constitution and weight of wool.

The South-Downs produces the best mutton of any of the British breeds of sheep, except the mountain breeds of Wales and Scotland. The wool is equal in fineness to ordinary half blood Merino, and makes strong durable cloth. The average weight of fleece in good flocks, is from four to six pounds for breeding ewes, and from six to eight pounds for rams and wethers, unwashed. The wool contains but little yolk, and wastes comparatively little in scouring. A three year old South-Down ewe, belonging to the Michigan State Agricultural College, gave on the 3d of June last a fleece of one year's growth, which weighed 7 lbs. 5 oz. She weighed before being shorn, 135 lbs. Her lamb, ten weeks old, weighed on the same day, 47 lbs. The sire of this ewe was a ram of the Webb stock, bred by Samuel Thorne, of Washington Hollow, New York, who has for several years kept a fine flock, mostly of this family. The figure accompanying this article was taken from a two year old ram, called "Son of Archbishop," owned by H. G. White, of South Framingham, Mass. His sire was Archbishop, bred by the late Jonas Webb, and imported by Mr. Thorne. His dam was an imported Webb ewe by Reserve, imported by Mr. Taylor, of Holmdel, New Jersey.

WELLS AND DICKINSON MERINO SHEEP.



During the war of 1812–15, Messrs. Wells & Dickinson, of Stubenville, Ohio, established at that place, the first woolen manufactory west of the Alleghanies, for which they received a bonus from the General Government. These gentlemen, soon after they commenced the manufacture of woolens, at the place mentioned, interested themselves in the introduction of Merino sheep, and in the course of a few years established a flock of several thousand. This flock was the source from which most of the fine-wooled sheep in several counties of West Virginia, Western Pennsylvania, and a portion of Ohio, were derived.

It is well known that the highest priced fine wool produced in this country, has for many years been obtained in this section. The sheep which bear this wool have, until within a few years, been almost entirely of the blood of the Wells & Dickinson flock. Lately the Silesian Merinos, introduced by Wm. H. Ladd, of Richmond, Jefferson county, Ohio, have been considerably used for crossing the old Wells & Dickinson stock, and in some instances crosses have been made with rams from Vermont. Except in the latter cases, the quality of the wool has been kept up. Under the demand for coarse fabrics, which was caused by the late war, the usual distinction in price between coarse and fine goods was nearly obliterated. A return to the old order of things, will probably cause fine wool to bear nearly the same relation in regard to price, as compared with coarse, that formerly existed. This remark should not be understood as referring at all to wool adapted to combing purposes, as that stands in a class by itself. Even during the present year, the price paid for wool in the section before referred to, has been considerably higher than ordinary Merino has brought—from ninety cents to a dollar a pound having been, in many cases, obtained.

The old Wells & Dickinson flock, by furnishing rams to the farmers of a large portion of the western country, was the means of bringing up the quality of western wool, particularly that of Ohio, to a high standard. Indeed it is a fact that flocks of great excellence were established by starting with common or so-called native sheep, and using rams of the Wells & Dickinson stock thereafter. The fine and well known flock of the late J. W. Dana, of Beverly, Washington county, Ohio, may be mentioned as a successful example of this mode of breeding.

The Wells & Dickinson flock, under the general supervision of Mr. Dickinson, was bred with such care and judgment, that after a few years it assumed a type of its own to such a degree that individuals belonging to it could generally be identified. Not only was the wool fine, of good length, elastic, and of the *style* liked by manufacturers, but the quantity was not small considering the size of the sheep, which was rather below the average for Merinos, and the carcass was well shaped and handsome. The washed fleeces in many flocks averaged three pounds,—the wool being much cleaner than Merino wool in general.. In fact this characteristic of cleanness, or light shrinkage in the wool of sheep of this stock, has continued to the present time, in flocks that have not been crossed with coarser or yolkier stock. H. D. Tellkampf, of the firm of Tellkampf & Kitching, extensive wool dealers of New York city, in a late communication to the Rural New Yorker, puts the average shrinkage of *washed* fleeces, when scoured, as follows:

Virginia,	40	per cent.
Pennsylvania, fine,	44	"
Ohio, fine,	44	"
Wisconsin, medium and fine, about	48	"
Illinois, medium and fine, about	48	"
New York,	49	"
Vermont,	50	"
Michigan,	46	"

No particular specification is made in this table for the wool of West Virginia, it being included, probably, under the head of Virginia, although it is well known that the *fine* wool of the territory included in the State of Virginia, previous to its division, was chiefly produced in a few counties along the Ohio river—a section where the Wells & Dickinson sheep were for a long time kept in great purity.

The origin and history of the Wells & Dickinson flock is a subject of so much interest, that the following facts in regard to it have been obtained:

Mr. Dickinson, in a letter dated at Steubenville, Ohio, May 22, 1826, published in the eighth volume of the American Farmer, states that he purchased the foundation of the flock alluded to, of James Caldwell, of Pennsylvania, who was an extensive breeder of Merinos. He (Mr. C.) commenced the business at an early day, having in 1806 purchased a ram and two ewes of Gen. Humphreys, of Connecticut. He expended more than forty thousand dollars in purchasing, to use the language of Mr. Dickinson, "the *cream* of almost every importation from Spain, during the invasion of that country by the French." Mr. Caldwell accumulated a large flock, which, after the peace of 1815, was principally sold to Messrs. Howell, of New Jersey, who subsequently transferred it to Messrs. Wells and Dickinson.

The letter of Mr. Dickinson to the American Farmer, before referred to, is accompanied by one which he had received from Mr. Caldwell, which is valuable as furnishing a clear account of the origin of the Wells & Dickinson flock. Mr. C.'s letter is dated at Philadelphia, April 11, 1826. He says:

"In the fall of 1806, I purchased one ram and two ewes from Gen. Humphreys' Merino flock, for which I paid $300. This ram was accidentally killed a short time after, and in the spring of 1807, Mr. Basse Muller imported into Philadelphia six Merino sheep, which he said had been obtained by him from the Prince of Hesse Cassel. The sheep were all remarkably fine animals, and at Mr. Muller's request I took them to my farm and kept them till they had recovered from the effects of their voyage, and were in a condition to travel. I then prevailed on Mr. Muller to let me have one of these rams, and to name his own price. He consented to do this as a personal favor, and did not consider it a *sale*, when he named $100 as about sufficient to defray the additional cost and charges. The sum was paid by me with great satisfaction, though at that time I would rather have had a ram of equal quality *directly* from Spain; thinking it best to procure the water direct from the *fountain head*, as less liable to impurities than further down the stream. A sheep seven-eighths Merino *may* have all the external qualifications of a full-blood Merino; but no experienced breeder would think it equally safe or desirable to breed from such an animal, when the genuine full-blood could be obtained. I would prefer one of the best horses of Arabia for *speed and bottom*, to the most beautiful English racer, if I desired to propagate and perpetuate those qualities. And, *even now*, I would rather cross with the best Spanish ram than with the best Saxon Merino, unless I *knew* that the Merino had been kept pure and *unmixed* in Saxony. The contrary practice would be gradually but certainly breeding back again into the common stock of the country. I have, however, every reason to believe that the sheep imported by Mr. Muller were perfectly pure Merino, and Columbus [a noted ram] was the first descendant from Muller's ram and one of the Humphreys ewes. You were certainly wrong in thinking Columbus was the best ram in my flock. It was Americus that sheared 12½ lbs. of wool, which I sold for $25 cash. It was Americus that weighed 148 lbs. Americus was begotten by Columbus, and was, in my opinion, in all respects, a superior sheep. I now think that Americus was the best Merino ram I have ever met with, although I have traveled from Boston to Alexandria for the purpose of examining all the early importations from Spain, and of purchasing the best I could find. I have expended more than $40,000 in Merino sheep, but never could find one equal to Americus in every respect. I do not remember the weight of Columbus, but his fleece never weighed more than 9½ lbs., which I sold for $2 dollars per pound. Mr. Howell gave me $300 for Columbus, at a time when the best imported Spanish rams were to be had for $50. The same Mr. Howell gave me *five hundred dollars* for Americus. I presume you have mistaken these two sheep."

It will be seen by Mr. Caldwell's letter; that these two sheep had not only *fine* wool, but they produced, for that day, very heavy fleeces—that of Americus having weighed 12½ lbs.; and the wool was of such excellence that it readily commanded $2 per pound, cash. The wool was unquestionably washed, or it would not have brought such a price. If 50 per cent. shrinkage be deducted from the weight of the fleece of Americus, we have still a *scoured* fleece of six and a quarter pounds—a weight seldom equaled even at the present day, and which, when its superior quality is considered, must stand as extraordinary. In the seventh volume of the American Farmer, there is a communication under date of December 23, 1825, from John McDowell, of Stubenville, Ohio, in reference to some samples of wool which he had sent to Mr. Skinner, then editor of that publication. The samples were taken from Mr. McD.'s flock, which he states was derived from Mr. Dickinson. The quality of the wool was such that, as Mr. McD. stated, he obtained "*eighty cents per pound for the lot* [about 400 fleeces,] *in the dirt.*" Mr. McD. observes that "The country is more indebted to Mr. Dickinson than to any other man in it for the present standing of the Merino sheep; for when they were at the lowest ebb, perfectly degraded, and suffered to be adulterated, and destroyed in every manner, he meted to them the strictest attention, and maintained them entirely pure, and for many years supplied all the flocks of the West with full-bred rams." In relation to the samples of wool referred to, and the character of Messrs. Wells & Dickinson's flock, the editor of the Farmer remarks that he believes Mr. D. could "select from this flock individual rams and ewes in as great number and with fleeces as fine, as can be found in any flock of like number in any country."

John H. Ewing, of Washington, Pa., in a letter published in Morrell's American Shepherd, page 414, speaking of the introduction of Merino sheep into that section, says, "But of those most distinguished for their efforts, Messrs. Wells & Dickinson, of Steubenville, Ohio, are entitled to the greatest credit. They made great progress in wool-improvement, and spent a fortune to accomplish their purpose, and in establishing its manufacture."

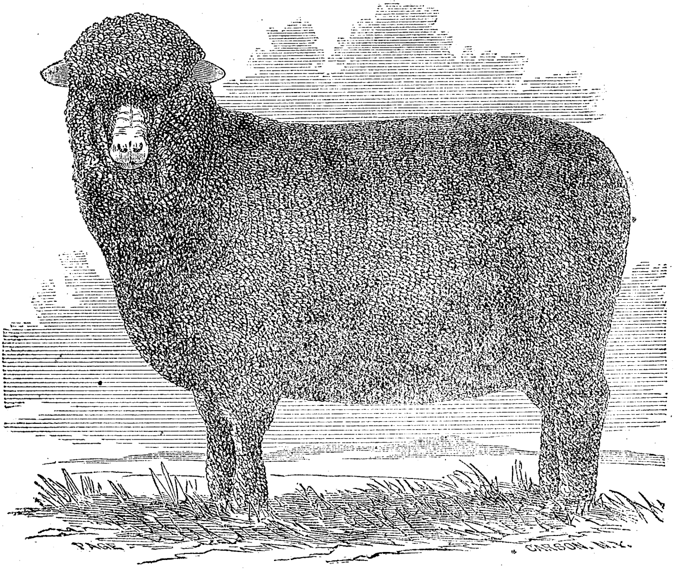
It will be noticed that the foundation of the Wells & Dickinson flock consisted almost entirely of sheep imported directly from Spain, and their descendants bred in this country. Mr. Caldwell's flock, transferred through Messrs. Howell to Messrs. Wells & Dickinson, is shown to have been derived from the Humphreys and other importations from Spain, with the exception of one ram from Hesse Cassel, purchased of Mr. Muller. Yet Mr. Dickinson succeeded in producing about as fine wool as was borne by any of the Saxon Merinos, imported into this country in 1826, and, subsequently, with much heavier fleeces. A test of this point was made by the Maryland Agricultural Society in 1826, by the offer of a special premium in the following words: "To the owner of the ram, which, being shorn on the ground [of exhibition], shall produce the greatest quantity of pick-lock wool." The competition was free for the Union. The exhibition was held near Baltimore, on the first and second of June of the year above mentioned. The first premium was awarded to Mr. Dickinson for a ram which he sent from Steubenville purposely for this trial. Wm. Patterson, of Baltimore, received a second premium for a Saxon ram, whose wool was said by the awarding committee to be a "a *shade* finer" than that of Mr. D.'s, but fell considerably short in quantity.

Mr. Caldwell's sheep, also, seem to have produced very fine wool. In a letter of his to John Hare Powell, dated Philadelphia, October 2, 1826, and published in a book entitled "Hints for American Husbandmen," Mr. C. says, in reference to an ewe, an engraving of which is given in the book: "I would not have exchanged that ewe for the best Saxon Merino I ever examined. You will observe that the head is covered with wool down to the nostril. Bare heads are apt to be accompanied by bare bellies and light fleeces. It must be perfectly well known to you that *many varieties* of Merinos were imported from Spain. I have examined most of these importations, and found none equal in value, in my estimation, to the variety of which this engraving shows the characteristic marks."

The flock of Messrs. Wells & Dickinson was dispersed, on the dissolution of that firm, several years since. Prominent among breeders who preserved this stock pure for many years, is the Hon. Jesse Edgington, of Holliday's Cove, West Virginia. Mr. E. is now deeply stricken in years. The main facts in regard to the origin of his flock, as I learned from interviews with him in April last, are as follows: He commenced sheep-breeding in 1821, with 200 ewes descended from the Humphreys importation, and subsequently added to these by the purchase of sheep from Messrs. Wells & Dickinson. He also used many rams from that flock, thus forming the basis of his own flock of 3,000. Until within the last few years, this stock has been bred without a cross. While Mr. Edgington was in active life, he devoted the most unremitting care to his sheep, and by judicious selections of breeding stock, fully kept up, if he did not actually improve his flock, and it became the nucleus for the improvement of others. His wool acquired such a reputation that the agent of the Middlesex Mills, Lowell, Mass., was in the practice of securing it in advance, at prices nearly optional with Mr. Edgington.

The figure accompanying this article was taken from one of two four-year-old ewes of Mr. Edgington's old stock, presented by him to the Michigan State Agricultural College in April, 1865. The one represented by the cut, weighed, before being shorn, on the second of June last, 75 lbs., and her fleece, of very superior quality, weighed 6 lbs. 3 oz.—she having suckled her lamb from the 18th of April, the time it was dropped. The other ewe weighed, on the same day, 73 lbs.; her fleece, of similar quality to that of the first-mentioned ewe, weighed the same—6 lbs. 3 oz. The fleeces were not washed, but were very clean for unwashed wool.

THE RICH MERINO SHEEP.



The late Hon. Charles Rich, of Shoreham, Vermont, established a flock of Merino sheep which obtained great notoriety, and was the source from which much fine-wooled stock sprung that has been the means of improving the flocks of other sections of the country. The origin of the Rich flock may be stated as follows:

About the year 1823, Mr. Rich, in connection with the late Leonard Bedell, then of Shoreham, Vt., purchased of Andrew Cock, of Flushing, Long Island, N. Y., his entire flock of

Merino Sheep. The main facts in regard to the origin of the Cock flock, appear to be comprised in a letter of the Hon. Effingham Lawrence, who resided in the same town with Mr. Cock, and was well acquainted with him and with his dealings in sheep. The letter alluded to was written to Dr. Randall, the author of the "Practical Shepherd," in 1844. Judge Lawrence says: "Andrew Cock was my near neighbor. We were intimate, and commenced laying the foundations of our Merino flocks about the same time. I was present when he purchased most of his sheep, which was in 1811. He first purchased two ewes at $1,100 per head. They were very fine, and of the Escurial flock imported by Richard Crowninshield, of Boston. His next purchase was thirty of the Paular breed, at $50 to $100 per head. He continued to purchase of the different importations until he ran them up to about eighty, always selecting them with great care. This was the foundation of A. Cock's flock; nor did he ever purchase any but pure blooded sheep to my knowledge or belief."

It appears from Judge Lawrence's statement, that Mr. Cock's flock was derived from "different importations," which comprised sheep of various Merino families or *cabanas*. His first purchase, it is said, was of two Escurial ewes, and his second was of thirty Paular sheep—probably comprising both rams and ewes, though this is not stated. After this, we are informed, he continued to purchase of "the different importations." It is not reasonable to suppose that these different importations were all of any one family. Most of the early importers paid little attention to any particular variety or *cabana* of Merinos; they generally purchased such sheep as could readily be obtained, whether called Agueirres, Escurials, Guadeloupes, Montarcos, Negrettis, or Paulars. Most of these were undoubtedly of what were considered in Spain, pure-blood Merinos, and such, according to Judge Lawrence's statement, were all the sheep purchased by Andrew Cock.

There is no evidence that Mr. Cock bred his Paular sheep, or those of any other family which his flock comprised, by themselves. Hence, at the time the flock was purchased by Messrs. Rich & Bedell, it consisted of different families of imported Merinos and their descendants. How those descendants were bred we are not informed, further than that Mr. Cock always adhered to the imported blood. It is true that several persons have certified that some of the sheep purchased of Mr. Cock by Messrs. Rich & Bedell, were *imported;* but whether the imported sheep alluded to were Paulars, or of any other Spanish family, does not appear. It seems, also, that Mr. Cock transferred to Messrs. Rich & Bedell a certificate—said to have been a *consular* certificate—originally given to Mr. Cock by the person from whom he purchased his Paular sheep, vouching for their purity, &c. It is not stated of whom Mr. Cock purchased the sheep, or by whom the Paulars were imported, although there may by reasonable ground for supposing that the certificate alluded to was that of Hon. Wm. Jarvis, who was for some time Consul at Lisbon, and was an extensive importer of various families of Merinos. It should be borne in mind, however, that the document could only refer to a portion of the sheep purchased by Mr. Cock, viz: the thirty Paulars.

The Rich flock, then, originally consisted of sheep either imported or bred by Mr. Cock, which were Escurial, Paular, and other Merinos. It seems that the Cock stock was entirely adhered to for many years. After the death of Hon. Charles Rich, his sons came into possession of the flock—the late John T. Rich retaining the homestead and five hundred of the sheep. In 1843, and for several subsequent years, a ram bred by Mr. Jarvis was used in this flock. Mr. J.'s position as Consul at Lisbon, gave him great facilities for obtaining sheep in Spain, and from 1809 to 1811 he sent many to this country. The ram alluded to as having been used in Mr. Rich's flock, was called Consul. He was an animal of much note; was the sire of S. W. Jewett's celebrated ram Fortune, and of many other fine sheep. Tyler Stickney, of Shoreham, Vt., the breeder of Fortune, and for many years well known as a breeder of Merino sheep, states that he purchased Consul of Mr. Jarvis when a lamb, in 1835, and that Mr. J. sold him "for a pure Spanish Merino." There is no doubt that he was such, but that he was entirely of any particular family of Merinos, is improbable. Mr. Jarvis imported Paulars, Agueirres, Negrettis, Escurials, and Montarcos, and for several years bred each family by itself, but after 1816, he mixed them all together, and bred from that time without reference to original family distinctions.* It will be remembered that Consul was bred in 1835, nineteen years after the amalgamation of the imported flocks. It is impossible, therefore, to form any idea as to the amount of Paular blood, or that of any other of the Spanish stocks mentioned, which ran in his veins.

Consul was, however, a superior sheep. The writer of this article saw him in the yard of Mr. John T. Rich, in May, 1845. A memorandum then made in regard to him, reads thus: "Consul is a ram of great value; is ten years old, yet he gave last year ten pounds of washed wool, of excellent quality. Old as he is, his fleece is still well set, and probably will not this year fall much, if any, short of its former weight." The wool of this sheep was quite long for Merino, finer than the average, soft, not very yolky, and nearly uniform in quality over the whole body. To what extent he changed the character of the Rich flock, I cannot say. His fleece appeared to me to be finer and evener in quality in all parts, than specimens of the flock represented to be of the old Cock stock. He was also more free from folds or wrinkles, corresponding in this respect more to the description given by Mr. Jarvis of the original Spanish Paulars. And as much has of late years been said about Paular sheep and their characteristic marks or points, it may be well to re-print Mr. Jarvis' description of this variety, premising that some of the animals to which Mr. J.'s language applies, were, as he states, selected by "Paular Shepherds" in Spain.

"The Paulars," says Mr. Jarvis, "were undoubtedly one of the handsomest flocks in Spain. They were of middling height, round-bodied, well-spread, straight on the back, the neck of the rams rising in a moderate curve from the withers to the setting on of the head; their head handsome, with aquiline curve of the nose; short, fine, glossy hair on the face; the skin pretty smooth, that is, not rolling up or doubling about the neck and body, as in some other flocks; the crimp in the wool was not so short as in many other flocks; the wool was somewhat longer, but it was close and compact, and was soft and silky to the touch, and the surface was not so much covered with gum. This flock was originally owned by the Carthusian friars of Paular—who were the best agriculturists in Spain—and was sold by that order to the Prince of Peace [Don Manuel Godoy], when he came into power."*

---

*Albany Cultivator for 1844, page 127.

This description presents a striking contrast to that which some other persons have given of Paular sheep. Instead of their being one of the handsomest varieties of Merinos, as Mr. Jarvis states, it has been represented that they were "more unsightly than some others;" that instead of a handsome head, they had "an ugly head;" that instead of the skin being "pretty smooth, and not rolling up or doubling about the neck and body, as in some other flocks," as Mr. Jarvis says, they "were characterized by a huge dewlap extending from the jaw to the brisket, so plaited and doubled, that if severed from the neck it would extend to twice the length of that member," and that "numerous large folds or wrinkles in the skin, extended over the neck, and occasionally on other parts of the body;" that instead of the wool being "soft and silky to the touch, and the surface not so much covered with gum" as that of "many other flocks," as Mr. Jarvis states, "the wool was exceedingly gummy, black, and hard to the feel, when grasped externally."†

In reference to these singular discrepancies, it is only necessary to bear in mind that Mr. Jarvis spoke of Paular sheep, as he had actually seen them in the original Spanish flock, and such as were selected for him by Paular shepherds, some of whom came to this country with the sheep which Mr. J. imported, and of course could unerringly point out individuals of the Paular family.

---

*Albany Cultivator for 1844, page 127.

† Letter of H. S. Randall, L. L. D., in the Albany Cultivator for 1844, page 25.

So far as relates to the intrinsic merits of the Rich sheep, it of course makes no difference whether they are Paular or a mixture of that and other families of Merinos. It is well, however, to observe the principle of calling things by their right names—at all events, to refrain as much as possible from calling things by *wrong* names.

There can be no doubt as to the actual value of the Rich sheep. They produce good wool, are hardy, and thrive well with only ordinary care. This is not merely true in reference to the stock as kept in Vermont, but has been equally so in Michigan, and wherever it has been introduced. It may be proper to say here, that the Rich stock was that from which the well known "Robinson sheep" sprung. Hon. Charles Rich, of Lapeer, Mich., son of the late Hon. Charles Rich, of Shoreham, Vt., previous to his removal to this State, resided in the last named town, and kept sheep of the old Rich stock. He let Erastus Robinson, who had been in his employ several years, have the sheep which were the foundation of the Robinson flock. Subsequently Mr. Rich removed to this State, and when his farm, which he took in a wild condition, became suited to the keeping of sheep, he brought from Vermont some of the old family stock, and has bred from them ever since. His flock has done well in every respect, and has been the means of greatly improving other flocks in the State.

The figure accompanying this article was taken from, and is a good portrait of, a three-year old ewe bred by Mr. Rich, and now owned by the Michigan State Agricultural College. She weighed before being shorn, on the 2d of June last, 81½ lbs. Her fleece, of eleven months' growth, weighed 7 lbs. 1 oz.—unwashed, but very clean for unwashed wool, and of superior quality for Merino. She had no lamb.

PUBLIC SHEEP SHEARINGS:

ON WHAT PRINCIPLES SHOULD THEY BE CONDUCTED?

The practice of shearing sheep at public exhibitions, or what may be called *matches*, is becoming popular in this State, as it has for some time been in other parts of the country. At the most of these shearings the object, heretofore, seems to have been to compare the weights of the fleeces as taken from the sheep, sometimes with reference to the weights of the sheep themselves, but generally without regard to the actual weight of wool or its value. The "biggest fleece" has been the main object. It is obvious that this presents no tangible idea in regard to the intrinsic value of the fleece or the profits of the sheep. The main point of interest to all, is, what sheep are really most profitable, in reference to the purposes for which they are kept—wool and mutton.

It is gratifying to see that some steps have been taken during the past season, to place this matter on a better basis, although no plan has as yet been brought out which would afford a fair and thorough test in reference to the comparative profits of the animals. In several instances attempts have been made to ascertain the amount of clean wool produced in proportion to the weight of carcass. The first of these trials was instituted by the New York State Sheep and Wool-Growers' Association, at an exhibition held at Canandaigua, on the 11th of May, 1865. On this occasion, fifteen sheep—ten ewes and five rams—competed for a premium of $50, offered by Hon. D. D. T. Moore, of Rochester, in the following language: "For the fleece of one year's growth, or thereabouts, which on being cleansed, shall be found to give the greatest weight of wool in proportion to the time of growth, and to the live weight of the animal."

The committee appointed to superintend and report upon this trial, took great pains to analyze and arrange the facts involved in it, and have placed the same in a tabular form as follows:

NAME OF OWNER.	Order of merit.	Sex of animal.	Age in years and days.	Condition of animal.	Weight of animal.	Wt. of fleece shorn.	Wt. of scoured wool.	Per cent. of fleece to live weight.	Per cent. of scoured wool to live weight.	Per cent. of scoured wool to fleece.	Per cent. of shrinkage.	Age of fleece in days.	Quantity produced in each day.	Quantity produced by one pound of animal in one day.	PRIZE COLUMN. Am't wool produ'd by one ℔ of animal in a year.	Quantity produced by each animal in one year.
A. H. Clapp,......	1	ewe	2.	fair.	49.	9.85	4.75	20.	9.6	48.	52.	367	.01294	.000264	.09636	4 72
L. J. Bovee,.......	2	ewe	.356	fair.	53.	11.21	4.50	21.1	8.4	40.1	59.9	356	.01264	.000238	.08687	4.60
Wm. M. Holmes,...	3	ewe	1.43	good.	47.	8 97	4.43	19	9 4	49.3	50.7	408	.01085	.000230	.08395	3.94
D. W. Percy,......	4	ewe	2.	good.	63.50	14 43	5.12	22.7	8.	35.4	64.6	373	.01372	.000216	.07884	5.
M. F. Gibbs,......	5	ram	1.1	good.	50.50	11.31	3 97	22.3	7.6	35 1	64.9	366	.01084	.000214	.07811	3 94
Josiah Taft,........	6	ewe	.331	thin.	33.	7 03	2.28	21.3	6.9	32.4	67 6	331	.00688	.000208	.07592	2.50
O. S. Williams,....	7	ram	2.	thin.	61.	10 81	4 47	17.	7.3	41.3	58.7	368	.01214	.000199	.07263	4.43
E. Gazley,.....	8	ewe	1.20	fat.	99.50	8 90	7.31	8.	7.	82.	18.	385	.01838	.000189	.07098	7.06
Arnold & Green,...	9	ewe	2.	good.	55.50	9 15	3.59	16.	6.2	39.2	60.8	336	.01068	.000192	.07000	3 88
P. H. McMillen,...	10	ewe	1.4	fair.	68 50	12 42	4.81	18.	7.	38.	62.	369	.01303	.000190	.06935	4.75
Theron Steele,.....	11	ram	1 60	good.	77 50	15 72	6.25	20.	8.	39.1	60.9	425	.01470	.000188	.06862	5 31
G. S. Center,......	12	ewe	1.347	fair.	54.50	10.25	3 33	18.	6.1	32.4	67.6	341	.00976	.000179	.06533	3 56
J. C. Sweet,.......	12	ewe	2.	fair.	78 50	17 50	5.31	22.2	6.	30.3	69.7	376	.01412	.000179	.06533	5.12
A. J. Blood,.......	12	ram	4.	good.	95.	20 09	6 53	21.	6.9	32.6	67.4	385	.01703	.000197	.06533	6.20
L. J. Bovee,.......	13	ram	1.15	good.	108 50	18.09	5.18	16.	4.7	23.6	71.4	380	.01363	.000125	.04563	4.94

It will be observed that the weight of fleece in proportion to weight of carcass is all that is aimed at, the *value* of the fleece being left entirely out of the question. The manner of ascertaining the amount of clean wool comprised in each fleece, is stated by Mr. Goffe, manager of the Syracuse Woolen Mills, who directed the process of cleansing, as follows: "The wool was washed by taking 16 pounds of soda ash and 32 pounds of salt, dissolved in 150 gallons of water in a large tub. I then took a small tub and dipped out a sufficient quantity to wash one fleece, then put in the fleece and scoured it in the small tub, then took out the wool and discharged the liquor, and washed each fleece in this manner, so that none of the wool was lost, wasted, or mixed with the other. In drying the wool, we laid it on a cloth on the wire screen, over our dryer (which is inside the mill), so that none of it was lost in drying. The strings were kept with each fleece, and put with them when weighed after scouring." It is added that this process is the same as that through which wool is put for manufacturing—the object being to take out all the animal oil, in order that the wool may take color in dying.

Of the fifteen sheep which were entered for this trial, fourteen were Merinos, the other a yearling Cotswold ewe. The rules adopted by the committee seem to have been as fair in reference to ascertaining the weight of wool in proportion to carcass, as the circumstances of the case would admit; and yet they did not embrace all the material points. The weight of the sheep, for instance, was only taken at the time of shearing, and this is assumed as the weight during the whole period of the growth of the fleece. The committee probably could not do otherwise, as they are supposed to have had nothing to do with the sheep till the day of exhibition. But it is obvious that their deductions may have been rendered fallacious on this ground. A sheep may have been kept for ten or eleven months of the year in such a way as to produce the greatest growth of wool, and for a short time immediately preceding the exhibition so reduced in weight of body that the proportion of wool would be much greater than if the average weight of the animal for the year had been taken.

Let us see whether something of this nature does not appear in the table. The premium was awarded to Mr. Clapp's two-year-old Merino ewe, whose weight was 49 pounds, and whose fleece, scoured, weighed a fraction under 4¾ pounds, for a year's growth, or at the rate of about 9½ pounds to 100 pounds weight of carcass. Her condition is put down as "fair." Mr. Gazley's yearling Cotswold ewe weighed 99½ pounds; her scoured fleece weighed 7 pounds, or at the rate of a little over 7 pounds to 100 pounds weight of carcass for one year. Her condition is put down as "fat"—the *only* sheep among the fifteen that competed for the premium whose condition is so recorded. Now suppose the Cotswold had, just before the exhibition, been reduced to the same condition as the Merino, would she not have produced more wool than the Merino, in proportion to the weight of carcass?

But suppose the premium had been offered for the sheep that should give the best returns in wool and flesh—that after being shorn the wool should be sold, and the sheep sold as mutton. How would the case have stood? Which would have shown the most profit? It is true we are without any information in regard to the cost of the food which the animals had eaten. The Merino was about twice as old as the Cotswold, and weighed about half as much. Admitting that the amount of food consumed was in proportion to weight, the Merino had eaten as much in her lifetime as the Cotswold. The Merino had produced two fleeces. We have no information as to the weight of the first fleece; if it would have weighed three pounds, cleansed, it was pretty heavy as compared with what she did at two years old. We have, then, two fleeces, say 7¾ pounds of cleansed wool, worth, perhaps, a dollar per pound—$7 75. We do not know whether the "fair" condition of the sheep indicates that the mutton would have been marketable or not, but let it be considered so, and reckon it at the same price per pound as that of the "fat" Cotswold, say eight cents live weight; the Merino carcass, 49 pounds, would come to $3 92, making with the wool an aggregate of $11 67.

We will reckon the Cotswold wool at the same price as the Merino, though it was probably worth more; seven pounds would come to $7; the carcass, 99½ pounds, at eight cents, would come to $7 96, making with the wool an aggregate of $14 96, being a balance in favor of the Cotswold of $3 29.

But the table is suggestive on many important points. The difference in the shrinkage of wool in going through the process of scouring, is very striking, particularly the difference in Merino and Cotswold—the shrinkage of the fourteen Merino fleeces averaging 64 per cent., and that of the Cotswold being only 18. The difference in shrinkage between the Merinos themselves is also great. Comparing the ewes, we find that Mr. Clapp's, which took the premium, weighed 49 pounds, and produced a fleece which weighed 9.85 pounds, before being scoured, and afterwards 4.75 pounds, being a shrinkage of 48 per cent. The per centage of scoured wool to live weight is 9.6. Mr. Sweet's ewe, No. 12, weighed 78½ pounds; her fleece weighed 17½ pounds before being scoured; and 5.31 pounds afterwards, being a shrinkage of 69.7 per cent. Her per centage of scoured wool to live weight is only 6.

The rams present similar contrasts. We will take two of the same age, about a year, both reported as in "good" condition. Mr. Gibbs' ram, No. 5, weighed 50½ pounds; his fleece before being scoured, weighed 11.31 pounds; afterwards, 3.97 pounds; being a shrinkage of 64.9 per cent., and a per centage of scoured wool to live weight of 7.6. Mr. Bovee's ram, the last on the list, weighed 108½ pounds; his fleece, before being scoured, weighed 18.9 pounds; afterwards, 5.18 pounds; being a shrinkage of 71.4 per cent., and a per centage of scoured wool to live weight of 4.7. The 20-pounds fleece of A. J. Blood's four-year old ram, gave 6.56 pounds of scoured wool.

The committee, in summing up their remarks on this contest, say: "It will be at once seen that the small sheep have greatly the advantage, as the rule in the main is proven to be true, that small sheep, having more surface in proportion to their weight, give more wool per pound of body. * * * * *For the mere purpose of wool-raising, very large sheep are not desirable.*

Several sheep-shearing matches were held in Michigan during the past season, two of which, those at Jonesville and Coldwater, the writer attended. The main results in regard to these, will be found in this volume in the reports of the associations under which they were held. The Jonesville association was the only one in the State, so far as I am informed, which offered premiums for scoured fleeces. Having never attempted anything of the kind before, they will doubtless be able to improve, by experience, on the details of their plan, making more particular requisitions in regard to some points to be observed by competitors than their first programme comprised.

As these matches will probably be considerably multiplied in the State hereafter, it may not be improper to suggest to persons or associations interested in them, the importance of adopting the most perfect tests in reference to showing the relative profits of sheep, that being the main point aimed at, or which should be aimed at. There is, of course, no impropriety in endeavoring to ascertain what sheep produce the greatest *quantity* of wool in proportion to weight of carcass; but it would obviously be better to consider the *value* of the wool. To ascertain first, the quantity of wool produced in a year in proportion to the weight of carcass, something more is required than just to weigh the sheep on the day they are shorn. They should at least be weighed at the beginning of the year, and it would be better to have them weighed every month—taking the average of the different weighings as the actual live weight during the period of the growth of the wool. In the second place, to ascertain the value of the wool, each fleece should be subjected to the appraisal of some competent person or persons.

The necessity of the fleeces being scoured cannot be too strongly insisted on, as nothing short of this can determine the actual weight of wool, and without knowing that, we have no basis for fixing the value of the fleece. The table comprising the results of the New York trial, shows how deceptive the large yolky fleeces are, and yet it said by persons who witnessed the shearing of all the sheep on that occasion, that those which were the most *gummy* did not compete for the premium on scoured wool. At the Jonesville shearing, a ram's fleece that weighed 16 pounds as shorn, gave only 4 lbs. 5½ oz. of scoured wool. It is worse than throwing money away to offer premiums for this waste matter. Its production is more than a dead loss, because of the expense of the labor and materials required to cleanse the wool from it. Yet this useless stuff has cost something. All animal secretions are derived from the food the animal eats, and this oily matter in wool has come from the grass, hay, roots and grain, which the sheep has eaten—in fact, it was derived from the most valuable elements of the food. Besides this, it is well known that sheep which secrete the greatest amount of this matter, consume most food in proportion to their weight, and have the least tendency to fatten.

BREEDING HORSES.

[It is a well-established fact that no one breed of horses is adapted to all purposes. Horses perform certain actions, according to their shape and proportions. Hence, it results that the conformation of the animal should be varied according to the character of the work required of him. No one would think of choosing horses of the same shape and points for heavy draught and for running, and it might easily be shown that a difference in shape and action between the trotter or roadster and the galloper or racer, is required. The race-horse has of late been bred with the most scrupulous care in reference to a certain object—the greatest degree of speed in the gallop under a light weight on the back. The modern breed of race-horses, known as the English thorough-bred, is of comparatively recent origin, and of considerable intermixture of blood, but in reference to mere speed in the gallop for short distances is undoubtedly superior to any other. Some advocates of the so-called thorough-bred horse contend that stallions of this breed only should be used for breeding all other descriptions of horses, except, perhaps, those for heavy draught. Some of this class admit that for roadsters and trotters, a cross between the racer and some other stock is preferable to the full-blood racer, but yet, with singular inconsistency, they are in favor of breeding from the mare only of this cross, constantly resorting to racing stallions as sires—apparently overlooking the fact that every generation thus bred approximates more and more to the character of the racing breed, and of course makes a corresponding deviation from the true standard or ideal which it is admitted is produced by a cross. The main question which the case presents is this: There being no distinct and established breed of roadsters, is it expedient to produce one, and if so, by what course of breeding? As tending to exhibit this subject in a proper light, the following article on the "Cross-breeding of Horses," by the distinguished veterinarian, W. C. Spooner, is copied from a late number of the Journal of the English Royal Agricultural Society, a few notes being interspersed.—S. H.]

It is now nearly five years since I discussed the subject of cross-breeding in the pages of this Journal, Vol. XX, with more particular reference to the breeding of sheep; my paper excited some little attention, and I had no reason to complain of the criticism it received. In the meantime, I have seen no cause to doubt the truth of the principles then advocated, or the facts adduced in their support. I propose, therefore, at the present time, to show the applicability of those principles to the horse, more particularly the saddle-horse, and I hope to illustrate this branch of the subject with equally strong examples. Amongst the points I sought to establish were the following: That the influence of the male or female parent is not capricious; but yet not always alike: in a majority of instances the male parent governs the size and external shape of the offspring (particularly in the back and hind-quarters), whilst the female influences the constitution, the nervous system, and often the head and forequarters—the case being, however, occasionally reversed. That this combination, which may be more a mechanical than a chemical union, by no means implies such an equal division of influence as the mingling of two fluids, in which case the offspring would be unlike either parent, but a *juste milieu* between the two, and there could be no handing down of type from one generation to another. It is rather such a fusion of two bodies into one that both defects and high qualifications are passed on from parent to offspring with a sort of regular irregularity, resembling the waves of the sea—each parent having remarkable power of propagating ancestral peculiarities, though latent in itself. Thus it is that strong characteristics are handed from one generation to another; so that if we seek by careful selection to remove a defect or propagate a good quality, we may calculate that a large number, perhaps a majority of the offspring, will meet our wishes, and by weeding out the remainder and pursuing this course for several generations we may accomplish our design. This view will further explain how it is that defects not seen in the first cross, being kept down, as it were, by the superior influence of the improving parent, re-appear in the next generation, and serve to deter timid breeders from continuing the experiment, or arm the opponents of crossing with strong but fallacious arguments against going beyond the first cross.

I pointed out that, owing to the superior influence of the male parent, the effect of the first cross in sheep was very considerable, bringing greater size, often longer wool, earlier maturity, and a propensity to fatten; or, in other cases, superior quality of mutton. Many persons who go thus far, are deterred from going any further by the very numerous failures which result from pairing together animals of the first cross, and consider that pure breeds only should be perpetuated; I adduced, however, various examples to show that crossing might be carried much further, even to the extent of establishing altogether a new breed, possessing qualifications which, although derived from them, yet neither of the parent breeds alone exhibited. I instanced the cases of the Improved Hampshire, the New Oxfordshire [Oxfordshire Down ?] and the Shropshire, and more particularly the flocks of Mr. Humphreys, as affording successful illustrations of the practice.

Special reference was made to Mr. Humphreys, who, starting with Mr. Jonas Webb's best prize Southdown rams, kept steadily to sires of his own stock, occasionally purchasing fresh Hampshire ewes, until in the course of twenty years he had established a first-rate breed, all of which were descended on one side from Mr. Jonas Webb's Southdowns. This example, as well as that of Mr. Rawlence, of Wilton, who now scarcely ranks second to Mr. Humphreys, seemed to show that the use of males and females possessing a similar amount of breeding is much more to be depended on than the system pursued by others who cross with the Sussex, when their sheep are getting too strong or coarse, and with the old Hampshire when they are getting too small.

I now further propose to inquire whether this system, which is so successful with sheep, is one altogether to be condemned with *horses;* always assuming that cross-breeding, to be successful, must be undertaken with a distinct and defined object, and assigning the highest praise and the first rank to those who maintain intact the purity of our best established breeds.

An opinion is very commonly entertained that there are only two pure breeds of horses in this country (ponies excepted), viz: the thorough-bred and the heavy cart-horse—all the rest being but modifications of these races in various degrees.

It is, however, probable, that long before either of these extremes were known among us, there existed a native breed of a very useful kind, pure examples of which are now scarcely to be met with. The *pack*-horse with his drooping hind-quarters, good shoulders, strong fore-legs, and sure action, existed in England for centuries before the Barb and Arab were imported for the chase or the race-course by the Stuarts, or the introduction of carriages had led to the use of Flanders mares brought from the neighboring continent; these heavy horses, with their high action, slow but sure and staunch, being naturally much prized for helping the ponderous coaches out of the deep ruts of the high roads or along the miry lanes. The heaviest of the race were greatly in demand not only for tilling the strong lands but for drawing the cumbrous road-wagon, before even the six-mile-an-hour luggage-van was introduced as a novelty and an innovation. I have before me one of Morland's striking sketches which reminds me forcibly of my boyish days, when the slow but sure approach of one of these ponderous vehicles with its eight or twelve-ton load, heralded perhaps by a cloud of dust ever stirred up by the heavy feet of the ten or twelve massive animals that moved it onward at the rate of some two miles an hour, never failed to command attention. It was a sight to behold these leviathans settle into their work after a short respite in the midst of a steep hill; the burly waggoner, too heavy to walk, and scorning to ride in his wagon, was mounted on one of those strong, sure-footed ponies, usually white or pie-bald, which have long since disappeared. A crack from his long whip would send into the collar with a 20-horse power the ten hairy-legged but powerful brutes, whose broad backs were rendered still broader in appearance by the absence of tails, for each horse was docked close to the stump, under the absurd idea that their strength would thereby be increased.

It is difficult to imagine that this wagon, which seemed to the people of the day to be one of the institutions of the country, was itself formerly looked on as a new-fangled novelty, which superseded the once universal, now well-nigh forgotten pack-horse.

There are but few specimens remaining of the pure pack-horse breed, which has been quite neglected and overlooked by agricultural societies; and consequently, whilst the mares have for a while proved valuable for breeding half-bred hunters with the thorough-bred horse, the males have been gelded and used up. This original or ancient race has no doubt been modified considerably in size, according to the fertility of the soil on which it might be raised; being sometimes developed into the strong upstanding harness-horse, and at others dwindling down to the plain but useful Galloway, as seen in many remote districts, and particularly in the little horses used in the Irish cars. The Welsh pony and the Clydesdale cart-horse, the latter enlarged by rich pasturage and perhaps a cross, probably represent the opposite extremes of this same breed.

In less civilized ages, the most useful horse was, that which could most readily be adapted to all purposes; and there is no good reason why, even in modern days, the more ancient breed, equally pure and more serviceable than the blood-horse or dray-horse, should be altogether neglected, not only by our sporting men, but by the patrons of our agricultural societies; particularly since magnificent hunters have been the result of the cross between the thorough-bred horse and the old pack-horse mare. It will be useful to point out the peculiarities which distinguish the two breds, with a few explanatory remarks on the component parts of the animal which by their varying proportions constitute those peculiarities.

The skeleton is formed of bone, which owes its solidity to the fact that it is composed of one-half or upwards of earthy matter, so deposited in cartilaginous cells as to render the bones strong and resisting, and adapted not only to support the weight of the animal, and to protect from injury the vital organs, but to serve as a frame work for the attachment of muscles, sinews and ligaments. The bones of the limbs are for the most part cylindrical, and motion is effected by means of joints at the extremities of the bones, which are secured by powerful non-elastic ligaments. The bones are much smaller in the thorough-bred than in the cart and intermediate breeds, though generally more compact, and the joints also are by no means so wide, but admit of more longitudinal motion. With this diminished size there is, of course, less surface to sustain the weight of the body.

The sinews resemble the ligaments in appearance, and like them are non-elastic; they are attached to the bones, and serve to communicate motion to them from the muscles, to which they are joined, or from which they appear to spring. Both ligaments and muscles are smaller in the thorough-bred than in other horses. The muscles and the flesh are the same, and are the seat of the motive power, motion being produced by the contraction of the fibres of which the muscles are composed. The strength is the result both of the size and number of fibres, whilst the extent of motion depends on the length of the muscles and their fibres. Of course the length of the bones corresponds to that of the muscles, and although the joints in the thorough-bred have more surface, they admit of more motion.

The pack-horse may be thus described: The prevailing colors of the breed were bay and brown, which with the usual accompaniments, of black legs, denoted a good and hardy constitution, yet other colors, such as greys and blacks, were to be found occasionally. Among the chief peculiarities were the good and flat fore-leg with its well developed back sinew or flexor tendon, the good and sound foot, and capital shoulders and forehand. The neck muscular but not thick and heavy, was fairly arched, and the head of moderate size, was well set on. This form was accompanied, as we might expect, with good and safe action in the walk and trot; the horse rarely stumbled, and only fell from overwork and exhaustion. Whilst the heavier and coarser specimen of this breed was capable of carrying his five-hundred-weight load throughout a long journey, the lighter and more active was used as the ordinary saddle-horse, or even as the hunter of the day. Many of these animals were extraordinary trotters, and as good trotters are generally good walkers likewise, the quality was greatly prized and encouraged; and thus a race of trotters was bred which, no doubt, were the ancestors of the celebrated American trotting-horses, such as the "Tom Thumbs" of later days. Although these horses were deep in the chest and ribs, the hind-quarters were comparatively inferior, the hips were often ragged, the tail set on low, and sometimes the hocks were rather too straight. The celebrated trotting-horses of Norfolk were evidently not the pack-horses, although, perhaps, allied to them; they had, no doubt, a touch of Spanish blood, and possibly of the thorough-bred.

[Lawrence, in his teatise on the Horse, published in 1809, (pages 172, 173,) states that the best of the Norfolk trotters proceeded from Old Shields; that Old Shields was got by Blank, a race-horse, "out of a strong common-bred mare." Succeeding Old Shields, was a stallion called Cub, or Useful Cub. He was said to have been got "by a black cart-horse, resembling the Suffolk breed, out of a chapman's mare." But it is said the stock was soon improved by crossing with another horse called

Pretender, which was by the aforesaid Cub, "out of a well-bred daughter of Lord Abington's Pretender, by Marske." It is presumed that this Pretender by Cub, is the same Pretender (or "Old Pretender"), to which Mr. Spooner refers, further on in this article, as having trotted fifteen miles in an hour. Lawrence mentions, that he was "informed, without being compelled to believe the fact, that he trotted a mile in two minutes and a half." He adds that there has been "produced from the above sources, the most active, strongest and best-shaped road stock to be found in this kingdom," and there is no doubt that their descendants are the best to be found in England at the present day.—S. H.]

Let us now, as a contrast, glance at the peculiarities of the thorough-bred horse. Racing, no doubt, existed in this country long before, but received a new impetus from the introduction of the Barb, the Arabian, and the Turk. The sires which were at first imported, quickly established the great superiority of the Eastern blood as regards speed, and when mares followed at a later date in smaller numbers, they no doubt still further added to the speed of the English race-horse.

The modern blood-horse is of much greater average size than the Arab or the Barb, either of the present or the past; and a doubt exists whether this is entirely due to selection and nurture, or to the early crossing with the native mare; in any case, it cannot be denied that every thorough-bred horse in the kingdom, from the highest to the lowest, is to the extent of more than nineteen-twentieths descended from the Eastern horse. This foreign influence was not, however, derived from one strain only, for the pedigree of "Eclipse" himself shows that besides his descent from the Darley *Arabian* and Godolphin *Barb,* he had five or six crosses of the *Turk;* and we have a strong conviction that the improved *native* horse, made up of the ancient British, the Spanish and the Barb, is entitled to some share in the honors of his parentage. Be this as it may, the present English thorough-bred horse has proved himself faster than any of the breeds from which he has sprung, and although many doubts have been cast, of late, on his powers of endurance in comparison with the smaller horse of some fifty years ago, and the practice of training and racing has been severely criticised, yet there is good reason to suppose that our first-class winners are as stout as most of those that have preceded them.

The thorough-bred English horse, in common with the Arabian, possesses no doubt more muscular vigor, as well as nervous energy, than any other kind of horse.* In addition to this he has a deep chest capable of admitting the large amount of air which the demands of the system require under severe exertion. By natural conformation and by artificial training all superfluous weight is removed, and thus he is capable of covering more ground in his stride, and of repeating these strides more frequently than any other horse, as well as of continuing his extreme efforts for a longer period without tiring. The heart and brain of such a horse are comparatively larger than in other breeds; the bones, though smaller, are more compact, the skin of a thinner and finer texture, and the blood-vessels more developed. These advantages, however, are not without certain drawbacks. The delicacy of the skin causes the animal to be extremely susceptible of cold; he is consequently less hardy and requires more food to keep up the animal temperature, so that it is difficult to keep flesh on a thorough-bred horse unless he is kept warm; moreover, the carcass being smaller, the stomach and intestines are not so large, and consequently the food must be concentrated and nutritious to keep up this supply of warmth.

---

*From time to time it has been suggested, with the view of improving our breed o thorough-bred horses, and particularly their staying qualities, to resort again to their original or parent breeds; but not to mention the ill-success of such attempts when made, it must be evident that the tendency of this cross would be to diminish the size and shorten the stride, and probably to render the action too high; we can therefore scarcely expect breeders for the turf to adopt the advice. At the same time it must be acknowledged that the Arab has been more successful with half-bred and under-bred mares than the third-class cast-off racer, inasmuch as with the undeniable bottom there has been a hardier constitution, better fore-legs, and higher action from this cross. Where the dam has been of sufficient bone and size, many good hunters and handsome harness-horse have been so bred, and still more frequently capital ponies and galloways; indeed this is one of the best modes of improving the breed of ponies. Arabs have, in proportion to their size and weight, larger bone and sinew than the majority of our thorough-breds, and I have often observed their beneficial influence in the second and third generations, both with hunters and other horses.

The difference as respects hardiness is strikingly shown between the foal of the cart-mare and the thorough-bred. Whilst the former is strong, sturdy and fleshy, the latter is comparatively puny, thin and susceptible of the least cold; the former, by means of the dam's milk, can be kept in first-rate order, whilst the latter requires artificial assistance as soon as it can be rendered. The fact is that the digestive apparatus is more powerful in the one than in the other—it can assimilate more nutriment from nutritious food, and subsist on rough diet on which the other would starve. This it is which renders it so expensive to rear the blood-colt, and this distinction prevails throughout life, and extends in a lesser degree to the half-bred, as compared with the cart-horse. The thorough-bred has yet other faults; as a rule he is slighter and weaker in the fore-legs, he goes closer to the ground, is often a bad walker, and an indifferent trotter, and is more liable to stumble and fall than the coarse-bred horse. How can it be otherwise? He is bred to win a race, from parents who have been winners; the elevated and rounded action that makes a good hack or charger, would shorten his stride and impair his chances; although if he has good legs and sufficient size and substance, the very fact of his being too slow for racing ought to be rather a recommendation as a hunting stallion than otherwise; yet who would give him credit for stoutness if he had never been fortunate enough to win a race; or what chance would he have for a prize at our agricultural shows when judged by those who can recognize at a glance a Derby favorite, or the winner of the St. Leger?

The term *stoutness* in racing phraseology means endurance connected with speed; it has nothing to do with size and weight, as a tyro might suppose: a great horse is often speedy but a craven at heart, whilst most of the stoutest race-horses of the last century were little more than galloways in size, and such, too, are the untiring Arabs of the Desert. No judge, therefore, can tell a stout horse by his appearance—it is necessary to know his performances before this can be determined; for, however perfect the symmetry and powerful the frame, if he is only good for a mile he is not stout.

The improvement effected in the size and probably in the speed of the thorough-bred horse, is no doubt very great, and every year produces some wonderful examples of first-class winners; yet I will venture to say that nowhere else throughout Nature, where the same care and vigilance is bestowed on the rearing of animals, are the blanks so many and the prizes so few. To justify this, perhaps, startling assertion, let us endeavor to trace the career of the, say fifteen hundred or more, thorough-bred foals, which are annually dropped. These foals are reared from mares of undeniable pedigree, and for the most part of good size, very many among them being winners. The majority are begotten by first-class horses, who have either been great winners themselves, or have been great winners before they have themselves broken down, or better still, have proved themselves the sires of great winners as well as winners themselves. Both care and expense are lavishly bestowed on the fifty or sixty sires, the two thousand brood mares, and also on the foals themselves as soon as they are dropped. The dam's milk is sustained with the most nutritious food, and the foal is fed with the best as soon as it can masticate. It is an error to suppose that either the mare or the foal is pampered or enervated by undue care; the well-kept paddock affords every facility for taking exercise, and those who have witnessed the sprightly and innocent gambols of the young animal will acknowledge that the muscles and sinews of the thorough-bred foal are called into play much more than those of the cart-horse. Yet with all this care what becomes of these costly toys? The greater number go into training at two years old, or earlier, no small percentage having previously disappeared from disease or accident, and very many succumb to the numerous maladies and mishaps that occur in the training stable.

After this ordeal the trials begin; and then some are condemned as too slow and others as too small; some are mercifully shot out of the way, others submitted to the auctioneer's hammer, and many a colt that has cost £200 to rear is sold for less than £10, and perhaps is dear at that price. The majority thus sold are colts and fillies that have never raced, many have given way in the joints or sinews, whilst some are rejected for their short-comings in the actual race, as two-year olds, although many a horse which was unsuccessful at that age has proved a prize-winner afterwards. It is difficult to say how many of those foaled actually make their appearance on the race-course, but the difference in numbers between the entries and the starters for the Derby will afford some slight criterion. At all events, a little reflection will satisfy us that the number of first-class, or even second-class horses that are annually brought to maturity, is very small, and justify our assertion that the blanks far outnumber the prizes.

How can we explain such a falling off, that the offspring probably to the extent of 70 per cent. should prove inferior to both the sire and dam? The answer may be found in the fact that although our first-class race-horses are powerful animals, yet they are descended from ancestors considerably smaller than themselves, and Nature makes a constant effort to return the original type. But for this natural law, there is no telling what size our thorough-bred horses might reach, for the constant effort of the breeder is to raise large colts, and it is almost an axiom with many men, that although a good *little* horse is all very well, a good *big* horse is a good deal better. In fact the little horses, which are sometimes greater winners, are rather low than small, and usually have considerable length of muscle as well as depth of chest and substance, to compensate for their want of height. When, therefore, there are such constant efforts to outstep Nature, we cannot wonder that failure should be so frequent a result.

[This great variation in the character of so-called thorough-bred horses, has attracted the attention of many careful observers. In an essay on the "Breeding and Management of Horses on a Farm," by John Burke, Jun., published in the fifth volume of the Journal of the Royal Agricultural Society, allusion is made to the supposition that a thorough-bred horse "must, *ipso facto,* be an animal likely to beget stock of a superior description," on which it is said: "Those who have paid only a moderate share of attention to the subject of breeding, must be aware that there is perhaps no distinct breed of horses, among which there are so many absolutely *worthless* animals, as among those that are thorough-bred." This fact, he adds, is fully borne outby the great numbers of "weedy thorough-breds" which are shown about the country. A writer on the horse, in "Bell's Life in London," some years since remarked, that "though a powerful thorough-bred is the finest form of a horse, bring me them at random, and I will engage that three out of four will be irredeemable rips."—S. H.]

There is a striking contrast between Derby horses and their numerous relations who figure at country races; and when the short racing career of these large colts is over and they are devoted to the stud it is astonishing how large they become and how much they girth.* They look the very incarnation of vigor and of strength, and it is probably their look that induces so many breeders to think that from such a sire any amount of substance can be secured, which can reasonably be expected in the weight-carrying hunter. They forget, however, how large a per centage of their progeny are but

---

* Although as a rule, half-bred and three-parts-bred horses have more bone, and are larger in the girth than thorough-breds, yet the latter increase surprisingly in girth when thrown out of training and devoted to the stud. My friend, Mr. Barrow, Veterinary Surgeon, of Newmarket, has kindly furnished me with the measurements of a number of first-class stud-horses, now under his care at Newmarket. Amongst others, "Longbow," "Toxopholite," "Thunderbolt," and "Muscovite," all of whom were upwards of 16 hands, and exceeded six feet in girth, and measured on an average eight inches round between the knee and the fetlock. The chest of the thorough-bred is always comparatively deep and capacious. Mr. Barrow considers that the capacity of the chest increases after serving mares and from wearing no rollers, or anything to interfere with the proper expansion of the chest. It must be borne in mind that the horses here mentioned are peers of their order.

"weeds," even when these sires are put to picked thorough-bred mares; and how very rarely the services of a horse of this stamp can be secured for half-bred mares. The great bulk of traveling thorough-bred stallions must necessarily be third-class horses, long in the carcass, long in the legs, weak in the sinews, unfit for any other purpose than the stud; and such are the horses that assist in deteriorating our breed of saddle-horses, and render horse-breeding so frequently unprofitable.

Let it not however, be supposed that I undervalue the importance of "blood" in the hunter, the hack, and the harness-horse; I only dispute the doctrine that we should rely mainly or solely on the sire for its introduction, and then only for the first cross. It is a well established fact, that the Eastern blood amalgamates with the native breeds of the country extremely well; it can be traced in the form, and still more in the courage and endurance, even in the third and fourth generation.

I must now recall attention to the general principles of cross-breeding, viz: that while the male governs the size (not mere height), the vital functions and the nervous system are influenced most by the female. If there be any truth in this doctrine, it must be as essential to attend to the pedigree of the mares as that of the sires. But here all is left to chance; and whether she has been taken from the plough-tail, the van, or the omnibus, no matter, so long as the sire is thorough-bred. Let us consider how the sytem works on some of our best mares. A farmer has a valuable mare that has been tested by many an arduous run. She is by a thorough-bred horse out of a half-bred mare, and valuable as she is, she is a shade too light, or at any rate would be worth more money if she were equal to a little more weight. He is induced to put her to a thorough-bred horse, and the progeny is, of course, seven-eighths thorough-bred, but, according to my experience, mostly an unprofitable weed. We might go a step further back, to the stronger half-bred mare, and trace the process of deterioration; but the final issue is the same—the propagation of a race of weeds. This is the real root of the evil which is affecting our breed of horses—an evil not to be remedied by the abolition of two or three-year-old races, or by the substitution of longer distances, or by any of the many suggestions with which, when political intelligence flags, our daily papers teem. Races for two-year-olds may be objectionable or otherwise, and eight-mile gallops may be excellent or cruel; but so long as racing is supported by the public as a pastime, the former will not be abolished nor the latter restored.* Do away with the excitement of the struggle, and by greatly lengthening the race render its finish the slowest part of the contest, and people will be contented to read the result in the newspapers at home. Let us suppose that the racing of two-year-olds was altogether abolished, and that the Derby was contended for by four-year-olds, what would be the result? The expense of keeping race-horses would be enormously increased, perhaps to the extent of £100,000 per annum. And after all, even if these innovations could be introduced, they would altogether fail in their professed object—that of improving the stoutness of the thorough-bred horse.†

We frequently hear of horses that are very speedy for a mile, but fail altogether in a longer race. Now on what does this want of stamina or stoutness depend? and secondly, can it be discovered or ascertained by the external conformation of the

---

*The system of racing at two years old, whilst it is always trying, and often fatal to the fore-legs and joints of the young animals, does not appear to be injurious to the *constitution*; for we have numerous instances of famous stud-horses living to a good age, although they have raced thus early. That stout and successful sire, the "British Yeoman," the winner of the first prize at the Royal Agricultural Society's show at Chelmsford, in 1856, fourteen years previously had won four large stakes as a two-year-old, and the following year ran fourth for the Derby.

†If some of our stoutest thorough-breds have been discarded in consequence of their not being speedy enough to win short races, what has become of these horses, whose services would have been so valuable for half-bred mares? I rather believe that speed and stoutness are mostly combined in great winners, as in "Eclipse" and "King Herod" of old, and at the present day in "Stockwell" and "Blair Athol," the latter of whom unquestionably won his great races by his stoutness, for he was probably equaled in speed for half the race by several of his competitors. Surely the St. Leger, and other still longer races, must in nine years out of ten be won by stout horses, and as such horses are always used for the stud afterwards, they must have handed down to their posterity their stoutness as well as their speed.

animal? The speed of the horse depends on the length of the stride, and the frequency or rapidity with which these strides can be repeated, and in proportion to these efforts is the demand made on the organs of respiration and circulation, and on the nervous system. Excessive speed is, therefore, in itself one cause of its short duration, inasmuch as it exhausts the vital powers. In many cases the locomotive and vital powers may not be well balanced; the former may be those of a first-class, and the latter those of a second-class animal. To a certain extent this want of bottom can be ascertained by the conformation, but to a certain extent only. If the horse is very leggy, light in the carcass, and narrow or deficient in depth of chest, the probability is that he is speedy, but not enduring. Sometimes, however, an animal shows none of these faults of form, and yet, though speedy for a mile, is unable to "stay." The cause is here beyond our ken; though it is, no doubt, due to the deficiencies in the vital and nervous systems, and especially to the latter. To discover its existence, we presume, is the object of the advisers of the four and eight-mile races.

In the absence of proof, we much question whether the first-class race-horses of the present are inferior in endurance to those of former days. Why should they be so? They are descended from the best mares and the best horses, which have no doubt handed down with their speed that endurance and strength of constitution which contributed so much to make a winner. Want of endurance is not the defect of this race; put a feather-weight on the back of a weed, and in a light country he will probably beat the most valuable half-bred hunter, even in a long run; and yet with all this he is nearly valueless.

Next to the very first-class race-horses—the twenty prizes amongst a thousand blanks—there is no kind of horse of which this country has such reason to be proud, as the half-bred, three-parts and seven-eighths bred hunters, the highest combination in nature of strength and speed. Deriving speed and courage from their Eastern progenitors, bone and substance from their Northern ancestors, and action in all their paces from the blending of the two races, they are nearly perfect and decidedly most generally useful.

When a breed of sheep or of bullocks has reached this point, we seek to perpetuate their excellencies by consorting parents who, on both sides, possess them, avoiding, of course, too great consanguinity. We do not resort, as a rule, again and again to the original breeds from whence the improvement has been built up. Why, then, should horses be an exception to this rule? Why, although the mares of this stamp are considered well adapted for breeding, are the males condemned to be castrated, as unfit for that purpose? By such practice we not only lose the services of the males in transmitting their good qualities, but deprive one-half the mares of the opportunity of breeding animals as strong and valuable as themselves. The practice is no doubt, in many respects a matter of convenience; for weight-carrying hunters are more tractable, and always, as geldings, command good prices; whilst it is hard to compete with the constant supply of ready-made stallions—good, bad, and indifferent—from racing stables, so long as their friends and owners can persuade breeders of horses and agricultural authorities that the goodness of the fore-legs is of little account, or that a bad thorough-bred stallion is better than a good half-bred.

Referring again to the general principles which have been laid down respecting the influence of either parent on the offspring, and considering that the temper, nervous system, vital powers and constitution, usually follow the dam, if the question be put—"Given a certain amount of breeding, which side would you prefer it to come from?" We unhesitatingly say, if it cannot be had from both sides, by all means let us have it from that of the dam, that her courage, nervous system, and vital powers, may be, if possible, joined with the great bone and sinew of the coarser sire. If this system were more frequently pursued we might breed weight-carrying horses from well-bred though rather light mares, and sometimes even from the best of the three and four-year-old mares cast out of the racing stables as not being good enough. By such means our cavalry would be far better mounted than at present, and we might, without difficulty, retain just as much breed as is requisite and desirable.* I do not, however, recommend such violent crosses as that of the cart-stallion with the thorough-bred mare, though not unfrequently successful; or the reverse case, which, with a few noted exceptions, produces more failures.

As examples are always more telling than precepts, I propose to adduce a few instances of successful breeding with half-bred horses, and well-bred mares.

1. To begin with my own experience: I rode a mare for some twelve years without her making a mistake. She was good in all her paces, a fair hunter, an excellent jumper, and a capital hack. She was bred by my father out of a three-parts-bred mare (a good hunter,) by a young half-bred horse, pedigree unknown or forgotten. Her dam, afterwards, bred three other colts by thorough-bred sires, none of which proved of any value. They could not carry weight, and none of them paid the expense of breeding.

2. A rather heavy but active and useful cart-mare, belonging to the same owner, bred two colts by thorough-bred horses, neither of which repaid expenses: they had the bodies of the dam and the legs of their sires.

3. One of my friends had, some years since, a splendid trotting mare that he justly regarded a pearl of great price, for she had substance, showed plenty of breed, and was good in all her other paces as well as the trot. After some years she was devoted

---

* An inspection of our Cavalry Regiments will strikingly illustrate the evils of the present system. I had an opportunity, a twelve month since, of looking over a rather large number of cast cavalry horses offered for sale by auction in a garrison town, and found that nineteen out of twenty were extremely faulty. In most, although the carcasses were sufficient, the legs were totally unfit to carry the weight a cavalry horse is called upon to sustain. Crooked legs, weak sinews, deficient bone, small joints, sickle hocks, the evident result of the union of the two bodies of a thorough-bred horse and a coarse or cart mare, was almost the universal rule, and they presented a strong contrast to the animals that in my experience used to be cast some thirty years ago when half-bred stallions were far more numerous than at present, and horses were bred from parents possessing on both sides the qualifications sought to be perpetuated.

to the stud, and bred five foals, the first by a good half-bred horse, and the others by different thorough-bred horses. Her first foal showed much more substance than any of the others, made a good price and is a valuable animal at the present day. Not one of the others repaid expenses; one proved a clever animal for a light weight, but none possessed sufficient substance to be anything like as valuable as the mare.

4. Another of my acquaintances, some years since, had a small, but very neat mare, almost thourough-bred. He put her to a large Yorkshire trotting stallion, and sold the produce at three years old, for sixty pounds; when, afterwards, he put her to thorough-bred stallions, the stock were all deficient in substance, and, conseqnently unprofitable.

5. A farming friend had a capital fast mare, somewhat small, and rather more than half-bred; he put her to the last named stallion, about one-fourth bred; the produce, a mare, now in my possession, is very clever and somewhat larger than her dam. Though too hot for the hounds, she is a capital hack, as well as an invaluable harness-mare. I consider this to be a successful example of breeding from two parents, both well, but neither thorough-bred. The dam of my mare was next put to a thorough-bred horse, and produced a foal which had not nearly the value of the first, gave out in the fore-legs, and was last seen in a London cab. The sire referred to invariably got good animals when put to well-bred mares, and useful ones when coarser mares was employed.*

[The horses here alluded to by Mr. Spooner, were of the stock known as Norfolk Trotters, or as sometimes called, Fireaways. Their origin has been noticed in some remarks connected with Mr. Spooner's article on a preceding page. There is no question as to the great value of the stock, and Mr. Spooner is by no means alone in his regret that it "has not been kept up in all its integrity." Though good specimens of the stock are not so numerous as formerly, some are still to be met with. It was said by Mr. Almack, several years since, in a prize essay for the Royal Agricultural Society, on the Farming of Norfolk, that the stock had been injured by crossing with thoroughbred stallions. In attending a show of the Yorkshire Agricultural Society at North Allerton, a few years since, where a large number of horses were exhibited, I found that the roadster class comprised many animals whose pedigrees traced to this stock. Several of these—among which was a fine trotting stallion, called Roan Napoleon, that took the first prize—were closely connected with some of the horses whose names are mentioned by Mr. Spooner. I met with specimens of the stock in other places in England, and they were certainly the best roadsters I saw in the kingdom. In general characteristics they closely resembled our Morgans, though in most instances somewhat heavier. Their height was from fifteen to fifteen and a half hands; their legs rather short, and their bodies compact, with well-developed muscles. In 1822, the late Kirk Boott imported into Boston a stallion of this stock, called Young Bellfounder. He was kept from the time he was imported till 1828, by the late Colonel Jaques, who then resided in Charlestown, Mass. At the last mentioned date, the horse was taken to long Island, N. Y., where he died, about 1830. He was the sire of some good roadsters and a few pretty fast trotters. A stallion of his get, taken to Columbus, Ohio, about 1837, was probably the root of all the "Bellfounder horses" in that State. Another sold by Col. Jaques to Mr. Rodman, and taken to Philadelphia, was said to have made considerable improvement in the roadsters of that vicinity. S. H.]

---

* This horse was the son of "Performer," and the grandson of "Old Pretender," by "Fireaway," (celebrated trotting stallions of their day,) out of a three-parts-bred mare, having the strains of "Forester" and "Hambletonian." "Old Pretender" trotted fifteen miles within the hour, with fifteen stone on his back, whilst "Fireaway" did two miles in five minutes. It is a matter of very great regret that this breed of horses has not been kept up in all its integrity, and that trotting matches have been allowed to sink into disreputable and low hands. Probably the cruelty that was often connected with the time-matches, in which the same horse was backed to go, say from London to York, or to Exeter, in some short time, led to their being discountenanced by the more respectable lovers of the horse.

6. Another of my acquaintances, some years since, gave £50 for a mare apparently three parts-bred, which now in her old age is such a model of symmetry that she attracted my special attention when recently exhibited at a local show. She proved to be a good hunter of average weight, but before she could establish her character, became lame, was devoted to the stud and had many colts. One of these by a thorough-bred horse became a very clever and valuable hunter of moderate weight; the other colts were mostly by a light and leggy but very active Suffolk cart-horse, with good flat fore-legs and good feet. The oldest of these, which promised to be a capital jumper and a good weight-carrying hunter, was bought by a farmer (a heavy weight in the hunting-field) for £50, and after exhibiting his qualifications in a good run, was re-sold for £100 on the same day. The new owner, hearing afterwards that he was got by a cart-horse, felt somewhat disgusted, and parted with the horse for £80, to a dealer, who very soon disposed of him for double the sum. The other two colts by the same horse are very promising. Although such a strong cross as this is not to be recommended, it is worthy of note as an example of the powers of the mare to transmit her qualities of speed and endurance to her offspring, so as to render them good hunters.

7. A late master of hounds in a neighboring county, rode for some years a three-parts bred stallion, that besides being a first-rate hunter, was also used somewhat extensively as a stud horse. His stock was almost universally good and remunerative to the breeders.

8. To these examples may be added some strong cases kindly communicated to me by Mr. H. Overman, of Weasenham, Norfolk:

"H. K. S., Esq., of W., Norfolk, had two horses of extraordinary good qualities as weight-carrying hunters; they had great pace and endurance, and were good performers. He rode them in Norfolk, Northamptonshire, and Leicestershire, and refused 700 guineas for the two. Their dam was a thorough-bred mare that ran well in the Oaks, and their sire was a half-bred cart-horse and hackney, with fine shoulders, good action, strong loin, deep girth, and good thighs and legs."

9. Mr. Overman adds: I used the same horse to two mares of my own, one a well-bred Irish mare. She threw a filly, which I sold for 100 guineas, and has since made nearly 200. The other mare was three-quarter-bred, and she threw a colt which turned out one of the best performers I ever saw. I sold him to H. B——, Esq., of Norwich, for his brother in Surrey, for 130 guineas, and 400 guineas have since been refused for him.

10. "One of the best horses in Lord H——'s hunting stables was by a Norfolk hackney, out of a half-bred hunting dam. We find in Norfolk, if we put our Norfolk hackney to a well-bred mare with size, she is sure to throw a good animal. 'Tom Moody,' the property of Mr. J——, of Hopeton, was not thorough-bred, neither was Mr. Goold's 'Shackaback;' and these two horses are the sires of scores of good and valuable horses in this country."

He adds: "The late Mr. Theobald, of Stockwell, in Surrey, always said that it was much better to put the hackney horse to the blood mare than to adopt the reverse plan; the former course being almost sure to bring a good animal. A blood mare, the property of an uncle of mine, bred seven foals by hackney and cross-bred horses, and all proved animals worth a good deal of money."

My purpose in adducing these examples is to show that useful horses almost always, and valuable ones very frequently, can be bred as hack, hunters and carriage horses, by using the half or three-parts bred stallion with well-bred mares, so as to secure a sufficient amount of substance to carry weight.

We have seen that with regard to sheep, at least, three different and valuable breeds have been inaugurated by cross-breeding, careful selection, and constant weeding; and the prevailing opinion is, that these possess certain desirable qualifications which render them more profitable than their parent races. Still there are those who deny this, and contend that there are pure breeds of sheep that can supply every requisite. Be that as it may, the case is much stronger with regard to the horse; for there is no one who would contend that the qualifications of a first-class weight-carrying hunter can be met with in any one pure or original breed, or that it can be otherwise secured than by the well-assorted alliance of blood and bone. Surely then, if with sheep we can succeed in the course of twenty years in establishing a distinct breed, we can with equal or greater ease establish a breed of horses that will support with ease a six-foot guardsman with his heavy accoutrements, and dash into the charge with all the speed and spirit induced by the influence of a full equivalent of blood derived from both parents. The French are already trying this system, and if we are remiss, will in a few years surpass our cavalry in its most essential characteristic. There can be no reason why the defects which crop out after the first cross should not be as readily extinguished in the horse as in the sheep.

It is well to notice, that valuable as is the Norfolk trotting stallion, when put to well-bred mares for breeding hacks, he is as a rule too deficient in size to get dragoon horses, or those weight-carrying hunters which have been the glory of our land.

One argument adduced by the universal employment of the full-blood sire is somewhat plausible, and has not perhaps been sufficiently disposed of. They say, it is desirable to have a pure-blood on one side at least, so that defects appertaining to the progenitors, but not apparent in the parents, may not, as in mixed pedigree, reappear in the offspring. This argument is good to a certain extent, but it applies equally to each parent, and if it can be dispensed with in the case of the mare in order to secure size and bone, it may also be given up for equal advantages in that of the sire, who would not have been devoted to the stud unless in addition to his pure lineage on one side, he had derived from the other some rare hunting qualifications and sterling merits which it would be most desirable to perpetuate.

CONCLUSIONS.

We have endeavored in our preceding remarks to establish the correctness of the following points:

(*a*) That the use of the thorough-bred horse or mare has greatly improved the coarser-bred in speed and in bottom. That the blood has amalgamated exceedingly well with other breeds, and that the good results of even one cross only have been seen in various degrees and for several generations.

(*b*) That the effect of crossing with the thorough-bred is to increase the supremacy of the nervous and the muscular systems, and is more particularly shown in the fuller development of the thighs, the hind-quarters and the elongation of the muscles generally. But that with these advantages the bones, joints, ligaments, and sinews, are smaller and less powerful, and the action, although quickened, is rendered lower and less safe. The ability for jumping and for carrying heavy weights without injury to the joints and sinews, is greatly diminished. The skin is also rendered thinner and more liable to abrasion, the carcass smaller, and there is a diminished capability for putting on flesh.

(*c*) That so long as suitable mares with sufficient substance can be procured, the breeder of hunters should on the rare occasions when they are offered, avail himself of the services of a first-class thorough-bred stallion, or even one of the second-class, provided he has hunting qualifications—good substance, or good high action in the trot or walk.

(*d*) If, going a step further in the same direction, the breeder seeks to put the female progeny to the blood-horse, he will most frequently fail; the offspring becoming too light; whilst if he had availed himself of the half-bred or three-parts-bred stallion, (the grandson of a great race-horse,) his stock having the same amount of breeding as the dam, would have afforded him a fair chance of realizing a high price, and failing this, a comparative certainty of a fair sale for the cavalry, or for the general market.

[Mr. Spooner has elsewhere spoken on this subject, in language so much to the point that an extract may well be introduced here. In a communication to the (London) Agricultural Gazette, several years since, he observed: "We obtain from the thorough-bred horse the small head, lengthy [hind] quarters, powerful thighs, and extended stride; but it is from the Norfolk trotter, the old English hunter or hack—descendants to some extent of the ancient Spanish horse—that we derive the oblique shoulder, elevated withers, good forehand, safe walk and fast trot, accompanied by a larger and wider frame, greater bone, and more powerful digestive organs than the blood-horse generally possesses. When once these varied qualfications are combined, it is *a fact accomplished*—the means in our hands for continued excellence by which we can impart to the next generation the requisite amount of breeding, without that risk of *weediness* which so often attends the first cross."—S. H.]

(*e*) Having duly recognized the claims of thorough-bred horses of the first and second class, we can only advise with regard to third and inferior classes, that their services be altogether dispensed with, their place being taken by three-fourths or half-bred stallions, possessing bone, substance, and good hunting qualifications. And it is such animals as these that deserve encouragement from our great agricultural societies.

For the encouragement of horses of this stamp we should be glad to see prizes offered for the best seven-eighths, three-fourths and half-bred stallions, so that the owners of promising horses might be induced to delay the operation of castration until the animals had undergone the ordeal of the show-yard, and the prize-winners might be launched into the world, with the Societies' approval. Some of the prizes for ponies might well be dispensed with to provide money, if it be wanting, for this more important purpose. At any rate, it may be hoped that the Council of the Royal Agricultural Society will remove the impediments which shut out such a horse as "British Statesman," the first prize-winner at Battersea, and the second at Leeds, from competing at Newcastle among the stallions for breeding-hunters. The flaw in his pedigree, one-eighth, gave him, no doubt, more bone, rendered him fit to carry an extra stone in weight, qualifications which doubtless gained him the prize of £20, offered by the gentlemen hunting the North Staffordshire hounds, for the best stallion for hunting horses.

This suggestion is not meant to imply that the prizes for thorough-bred stallions should be dispensed with; on the contrary, if the state of the Society's funds permit, separate prizes should be offered for thorough-bred sires, adapted,

1. For getting hunters;
2. For carriage-horses;
3. For park-horses, chargers, or hacks.

Prizes in each of these classes would then be assigned to animals differing much in character, but no longer, as at present, to the best race-horse, or according to the rather puzzling and peculiar condition of the prize-sheet, "to the horse best calculated to perpetuate the breed of the sound and the stout thorough-bred horse for general stud-purposes." Such a horse must unquestionably be neither more nor less than the sire of the greatest race-horses of the day.

But if this is too wide a range for an Agricultural Society, the Managers of the Islington Horse-Show may take this hint into consideration.

Those of our readers who were present at the splendid exhibition of thorough-bred stallions in the Agricultural Hall last summer, must have been struck with the great variety that obtains in the shape and action of the thorough-breds then exhibited, and might, without any assistance from the judges, point out the particular horses with suitable characteristics for each of the several purposes above mentioned. "Caractacus" and "Nutbourne" may be taken as correct examples of the true *race-horse.* The sprightly "Neville," with his splendid knee-action, may be regarded as the proper sire of the charger and the park-hack, whilst the powerful "Warlike," with his compact frame, is the very type of a weight-carrying hunter, so far as a blood-horse can be one. "Newcastle," the favorite of the judges, might put in a claim either as a hunting-sire for a moderate weight, or, with his fine action and good legs, as the sire of a charger or park-hack; and he probably gained his honors because he was thought to combine best in his own person the several and diverse qualifications required by the conditions of the prize-sheet. There were also some fine showy animals, with long arching necks and grand action, that might properly be considered as suitable sires for high-bred carriage-horses.

MANAGEMENT OF PASTURES.

The treament of pastures is an important topic wherever grazing is a leading branch of farming. By what course the land devoted to pasture, can be made to support the greatest amount of stock, or yield the best returns in meat or dairy produce, is the point to be settled. The answer, doubtless, depends somewhat on the character of the soil, and somewhat, also, on the climate. It is not proposed to enter here on a discussion of the question of the relative profits of grazing and grain-growing, but simply to consider how land that it is desired to keep in grass shall be managed.

As just intimated, the question is affected more or less by the soil and climate. On some soils grasses may be said to be permanent, while on others the same species have but comparatively a short period of life. A moist and uniform climate is also more favorable to the continued existence of grass than one subject to wide extremes of wetness and dryness, heat and cold. But almost every person of ordinary observation must have seen land on which grass lives or would live for an indefinite length of time. Let it be supposed now that it is desired to obtain from this land the greatest amount of nutriment in the shape of grass, year after year, or for a given number of years, how shall it be managed?

To begin with the land in its natural state, it will be found that such as is most favorable to grass is generally covered with a pretty heavy growth of hard-wood timber, consisting in this country, in a great degree, of the sugar-maple, in some localities intermingled with bass-wood, chestnut, elm, ash, &c. The timber, of course, is to be cleared off; this having been done, the question is, to plough or not to plough the ground? So far as experience has afforded an answer to this question, it seems to be decidedly against ploughing for the purpose of seeding the land to grass. In the hilly and mountainous portions of New England much land has been cleared, which from being very stony, could not be ploughed without great labor, and even then not well ploughed. It was got into grass in some cases by simply sowing the seed on the burnt surface, or in other cases by first harrowing the ground. Some of these lands have been in grass for a hundred and fifty to two hundred years, or more—some as pasture, and some as "natural mowing." The best hill-pastures of the section referred to, are on this land which has never been ploughed. Probably the first settlers took what they deemed to be the easiest, and for the time being, the cheapest way of getting the land set to grass, because they had not the means of obtaining more labor. At a later day, new land has been more frequently ploughed, affording in some instances the means of comparing the productiveness of the ploughed and unploughed tracts, for grass, and the results have generally, if not invariably, been in favor of the latter. It is found that the grass does not get so much "bound out," on the unploughed land. The vegetable matter, which during the forest growth is accumulated on the surface of the earth, seems to aid the growth of grass, and where it is not destroyed by a too severe *burn*, the sward keeps up its vitality better than where the natural position of the soil is reversed.

If then, it is conceded that in seeding new land to grass, ploughing is not advisable, the question arises, does it ever become necessary or expedient? The question, of course, is based on the supposition that the grass does not die, or at least that its vitality can be maintained without breaking up the sward. Reference has already been made to examples which this country presents of the durability of grasses,—examples which embrace as long a period of time as the settlement of the country admits. In European countries there are lands which have been in grass for a time beyond which neither history nor tradition runneth. The sheep pastures of Wales and

Scotland, are known to have been grazed a thousand years, in many instances without the application of any fertilizing matter except that dropped by the animals while grazing, and yet it is known that the land carries as much stock as it ever did. Some of the "old pastures" of England are so old that their age cannot be determined. So well established is the fact deemed to be that ploughing would be injurious to them, that leases of farms often prohibit the tenant from breaking up particular tracts. No farmer of judgment who has ever examined these rich old pastures, would think of ploughing them, so long as the greatest value in grass is the object. The soil is perfectly covered with those species of herbage which are most tenacious of life, and at the same time most nutritious. It is the unanimous testimony in regard to these pastures, that they carry more stock, and will produce more beef or mutton, and more butter and cheese, than the same land would newly seeded, and in regard to dairy produce, the *quality* of that from old pasture is much superior. There is no question, that experience in this country as far as it goes, agrees with these facts. It is not intended to say that there is not old grass-land in England which might advantageously be ploughed—undoubtedly there is such,—but there is also some which it would be unwise to break up, and the same may be said in regard to this country.

This subject was brought before the public by a discussion at the meeting of the New York State Agricultural Society, at Utica, last fall, on the question, "Ought pastures for the dairy to be kept permanently in grass, or to be renewed by ploughing and re-seeding?" The discussion was opened by X. A. Willard, of Little Falls, a gentleman who is well known to have devoted much attention to this and other matters connected with the management of dairies and dairy stock. He stated the points to be determined, as follows:

"What kind of pastures are best for the dairy? Are they those which have been long in grass, or are they those which have been recently ploughed and re-seeded? Can pastures be kept productive when remaining long in grass, or, in beginning to fail, is it necessary to renew them by ploughing and re-seeding? And, finally, what are the cheapest as well as the best modes of obtaining quality and productiveness of pasturage?"

Mr. Willard observed that: "we are not to consider the treatment of all pasture-lands alike, but of those that are particularly well adapted to grass. * * * What are we to do with pasture-lands that begin to fail? Shall we plough them up and re-seed, or shall we adopt some other mode of renovation? I know of pastures that have been in grass for sixty years and upwards, and to-day show no signs of failure. Wherever I have been through the dairy region I find these pastures, and it is the universal testimony of those who have them, that they are yielding better returns in milk than any recently re-seeded grounds. I have seen old pastures ploughed and re-seeded and put in meadow, when the annual crop for a few years was large, but when put back again in pasture gave poor returns, and took years in obtaining a nice thick sod. It may be said that the fault lay in re-seeding—that a greater variety of seed should have been sown, as timothy, the clovers, orchard-grass, blue-grass, red-top, &c. Our farmers, generally, seed mostly with timothy, clover and red-top, using the ground at first for meadow, and afterwards for pasture. What we want—and it is that which usually obtains in old pastures—is a variety of grasses springing up in succession, and those that will bear cropping, so that pastures will afford a good fresh bite from May to November. Old pastures are generally filled with a variety of plants that are adapted to the soil, and in taking off grain-crops, and then re-seeding, the conditions or elements of fertility are somewhat changed, so that anticipated results are not always obtained. In 1855 I ploughed up an old meadow, about two acres of which was yielding large crops of timothy and clover, but so siuated in the field that the hay-crop could not be got off in time. I took from these two acres the first year 180 bushels of corn, and the second year 100 bushels of barley, when the land was seeded down with timothy and clover. For two or three years it did not produce satisfactorily, though receiving the usual dressing of plaster, and I top-dressed it with stable manure, perhaps 20 loads to the acre, but without getting the large crops of grass that I did before re-seeding. Some mineral element, therefore, I supposed to be wanting, perhaps potash and soda, so I top-dressed with ashes and salt, and had no further trouble. I have seen quite a number of old pastures that were yielding tolerably well, ploughed with similar results. The land would bear abundant crops of grain, but grass failed to be enduring, or was less nutritious, and hence frequent ploughings and re-seedings were resorted to. I visited Mr. Butler's farm near New Hartford, last year. He buys cattle and fattens them for the market, and he told me he had never been able to fatten stock with that facility from grass raised on newly seeded grounds as on those put down many years ago, or from pastures that had never been broken up at all. Many others make similar statements.

"I shall not dispute the point that we may doctor up our lands to produce any desired crop, but to do so may be expensive, and will often require more science and skill than are common to the country. When nature furnishes the condition for producing grasses that give the best result in milk, and when these grasses become firmly established in the soil, are we not pursuing a suicidal policy in destroying them by over-cropping, or by allowing weeds to smother and crowd them from the soil, under the impression that our pastures can at any time be renewed by ploughing and re-seeding? Would it not be better and cheaper to exterminate weeds, and give our pastures some rest during the hot dry weather of July and August, by feeding sowed corn, instead of cropping down to the roots, and allowing the sun to roast them out and destroy the plants? It is the weeds and over-cropping and unprotected covering of pasture lands in hot weather, that are the fruitful sources of failure of grass in pasture.

"Now it is very unprofitable for the dairyman to break up lands that are yielding, or that can be made to yield readily, good crops of grass. Grain-raising, with many is considered a matter of necessity rather than choice, but grass fails and the lands are ploughed and re-seeded. This may be well enough for meadows, but is not so conveniently managed in pastures. If a part of your pasture land begins to fail, and it is designed to plough and re-seed, the land must be fenced, which is expensive and often very inconvenient. But, after getting it down to grass, cattle cannot be turned in until the plants become somewhat established, as they tread up the ground, pull out the grass by the roots, and by mid-summer you have a barren field. Again, to plough pasture-lands the herd must be reduced to meet the necessities of the case. This is also an objectionable feature, and one that is distasteful to the dairyman.

"When grass *utterly fails*, ploughing and re-seeding doubtless should be resorted to; but generally pasture lands may be kept permanently in grass by giving them a little extra care and attention. If they begin to fail from over-cropping or neglect, a judicious course of top-dressing and sowing seed will generally be found preferable to the plough. Usually on the black slate lands of Herkimer, plaster at the rate of 100 to 200 pounds to the acre, every alternate year, will keep pasture lands in good condition. I have found great benefit from the use of ashes, in connection with plaster, at the rate of two or three barrels per acre. Well decomposed horse-manure, hauled out in the fall, and broken up fine, and applied when cows are in the after-feed, has produced good results.

"My old pasture contains about 45 acres, and carries one year with another 30 head of cattle and a span of horses. I have no doubt that all pasture lands in the dairy region would be greatly benefitted by the application of bones, as this material is largely taken from the soil. Ashes are valuable in eradicating mosses, and in furnishing food for grasses, and are worth at least 25 cents a bushel for most of our grass lands. Lime is of great service to some soils. Six years ago I limed an old sidehill meadow, mossed over and not producing. It was applied at the rate of 40 bushels per acre, and the annual crop of grass ever since has been good.

"I am inclined to think that good old pastures produce a better quality of milk than those recently re-seeded, and that it would be better to renovate by top-dressing than to plough and re-seed. The trouble with recently re-seeded pastures is, the grass early in the season is apt to be rank, watery and more flashy than the thick, fine herbage of old pastures. Considerable portions of it often get the start, and soon become woody, and are rejected by stock. A recently re-seeded pasture will not bear cropping like one that is old. The larger species of grasses are so rank as to crowd out the smaller and finer grasses, which are the most valuable for the production of milk. The feed in old pastures springs up earlier and lasts longer than on grounds recently re-seeded. White clover and June or blue grass are valuable for producing milk; they are indigenous to our dairy soils, and are generally abundant in old partures, where they seem to thrive best.

"The character of the food which a cow eats has a greater influence on the quality of milk she yields than many imagine. During the drought last season, when the cows began to eat the tufts and portions of pastures that had been rejected or left to grow up high and rank, the quality of the milk was so depreciated that it took from 12 to 13 pounds of milk [the usual quantity being from 9 to 10 pounds], and in some instances more, to make one of cheese. You may, perhaps, get more bulk of grass by ploughing and re-seeding, and yet obtain poorer results in milk, than from the old thick sward that has been broken up. One great source of failure and decline of grass in old pastures is over-stocking. The lands are crowded to their utmost capacity year after year, and receiving scarcely any attention, must, of course, succumb at last. Again, weeds are allowed to go to seed and get possession of the soil, and where they thus overrun the grounds and destroy the grasses, doubtless the best course to be adopted is to plough and re-seed; but the true course is to pay attention to pasture-lands in season, giving them an occasional top-dressing, scarifying the surface in spring, and sowing seed here and there upon patches that are beginning to fail. As a top-dressing, sawdust in which the liquid manures have been absorbed, applied in fall or spring, gives great vigor and growth to grasses. It can be spread over the surface in a finely divided state, and is in condition to be available to plants. Road-scrapings and composts of muck, earth and manures applied in the fall and pulverized over the surface with a brush harrow, together with the use of ashes, plaster and lime, all of which are available to farmers, will be found of service in keeping up a permanent pasture. And it is believed by taking a few acres annually and treating them with manures, better results will be obtained at less cost than in ploughing and re-seeding. I may remark that in the use of barnyard manures, fresh cow dung ought not to be used on pastures for the dairy, as it produces grass distasteful to dairy stock, and some claim it to be the cause of abortions."

Hon. John Stanton Gould, of Hudson, followed Mr. Willard, and said he heartily endorsed Mr. W.'s positions. "There had bean great loss to farmers by ploughing and re-seeding pasture lands. An inspection of newly seeded grounds showed many unoccupied spaces, where the grasses did not grow. After a pasture has lain in grass several years, grasses natural to the soil begin to come in. There are some kinds of grasses that might be advantageously introduced by sowing the seed broadcast over the ground, and then top-dressing with manure. He referred to species of grasses, which he considered valuable and well adapted for grazing, as the meadow-foxtail, which is the earliest that grows, and gives a good bite ten or fifteen days earlier than any other. If we can have our pastures so as to turn out cattle ten days earlier than usual, a great point is gained. Next in order was orchard-grass. It comes earlier than the blue-grass. It springs up rapidly when fed off, and if it could be generally introduced, would prove of great value for pasturage. The only objection, that it grows in the form of tussocks, can be obviated by going over the ground with a fine-tooth harrow, and followed by a roller. The advantage of an old pasture is that you get a variety of grasses that completely fill up all the intervening spaces, but when only two or three varieties are grown, spaces will occur. However thickly you seed with one kind of grass, spaces will be left, where another kind will grow; so that by having a great variety, all the ground is occupied, and the different kinds thrive well together; but you cannot get this condition of things, except in permanent pastures or meadows. If pastures begin to fail, top-dress them with rotten manure, and leave them for one year in meadow. Seed, also, should be sown, and harrowed in, if required. Bone dust on some lands had produced great results, and experiments should be made on a few acres and their effects noted."

Rev. Mr. Loomis, of Herkimer County, "was acquainted with a pasture that had not been ploughed for twenty-eight years, and four acres of it had *never* been ploughed. Another had been down eighteen years. Had seen the first named pasture mowed recently, and the quantity taken off was one ton per acre. He had asked the farmer why he did not break up the four acres, and the reply was, 'I have got to be an old man, and my experience tells me that my old pastures are the best.' Knew another farm, a part of which was ploughed and stocked down six years ago, and part not. The latter was producing the best results. It had a firm, thick sod. The grasses in the old pastures were the best for milk. I have no theory to advocate in this matter, but have presented a simple statement of facts. The pasture referred to was put down with barley. The result in that case was that the land was filled with couch-grass and milk-weed. The former disappeared in eight years, and the latter in twelve years, and this is one reason why I would not break up old pastures. We can raise barley on our lands, but straw-fed animals are not the ones that give the most milk.

When we go to the wheat region to purchase milch cows, we find it takes about two years to get the straw out of them, or, in other words to get them in good condition for milk."

Mr. Hoyt, of Madison County, "claimed that the condition of the soil and climate should always be considered. Some pastures do best if left to grass; others require ploughing and re-seeding. He thought the Mohawk flats would support more cattle than the Onondaga lands, although the latter might produce more grain. He had owned land on the Mohawk flats, and found it most profitable to keep it in grass and to plough as little as possible. In Madison county it was necessary to plough and re-seed, or pastures would run out."

Other gentlemen who took part in the discussion, contended that it was better to plough pastures frequently; but generally, if not in every case, those who took this view occupied a different kind of land from that to which Mr. Willard's remarks applied—land better adapted, perhaps, to grain-crops, but not so natural to grass. In some correspondence with Mr. Willard, since this discussion was held, he has given me some further facts in support of his positions. In a letter dated November 7th, he writes: "I feel satisfied, not only from my own experience, but from extensive observations in the dairy districts, that the ground taken by me in the discussion is the true one. I went last week over the old meadows in Orange county, N. Y., which have not been ploughed for a hundred years. They produce, without top-dressing, about a ton and a half of hay to the acre, and it is held as worth 25 per cent. more in nutritive value than that grown on recently-seeded grounds. Mr. Lewis, of this county, has an old meadow, which, by top-dressing, produces enough hay for the winter keep of 50 cows. The Orange county people say they get better-flavored butter from old pastures, and I know that the best results in cheese in this region, are obtained from such pastures."

In an article by Mr. Willard, in the Utica Herald, he has spoken more particularly in reference to his observations in Orange county, and respecting the grasses which are found in the old pastures, he says:

"In the old pastures there are several species of grasses that spring up spontaneously, and afford sweet and nutritious feed, and from which the best qualities of milk and butter are produced. These grasses form a rich, thick turf, leaving no intervening spaces. The grasses are similar to those found in the old pastures of Herkimer, Lewis and Oneida. They embrace the June or blue-grass, *Poa pratensis;* the fowl-meadow grass, *Poa serotina;* meadow fescue, *Festuca pratensis;* red-top, *Agrostis vulgaris,* and the wire-grass, *Poa compressa.* Timothy, orchard-grass, red clover and other forage plants, are also grown in pastures and meadows. The June-grass is regarded as very valuable, throwing out a dense mass of leaves, highly relished by cattle, and from which a superior quality of butter is made. It is found growing throughout the butter districts of the county. The wire-grass is deemed one of the most nutritious of grasses, is very hardy, eagerly sought after by cattle, and is one of the best grasses for fattening. Cows feeding upon it yield milk of the richest quality, and from which the nicest butter is made. It flourishes well upon gravelly knolls and in shaded places, and its stem is green after the seed has ripened. It is found growing in all parts of the county. The meadow-fescue is common in the old grass lands where the sod is thick and grasses of different species are mingled together. It starts early in spring, is relished by stock, and furnishes good early feed. The milk-farmers hold it in high estimation as a grass tenacious of life, and not running out like timothy or clover."

The grasses above spoken of as "natural," are not considered by botanists as indigenous to this country; they were undoubtedly introduced from Europe, either by design or accident, but having obtained a stand here, "come in" naturally, or without the seed being purposely sown, in many cases. The June-grass, so called in some localities, is the famous blue-grass of Kentucky—*Poa pratensis.* It is extensively disseminated, and in the best pastures of this country as well as those of the British Islands, forms a large portion of the herbage. Its congener, the *Poa compressa*, sometimes called flat-stemmed blue-grass, frequently wire-grass, is not so common, though it will grow better on dry soils than the *P. pratensis*. It is even superior in nutritive properties to the latter, and is generally placed at the head of all grasses in this respect. The opinion of the Orange county dairymen, that it is one of the best grasses for fattening and for producing the finest-flavored butter, is supported by the testimony of every one acquainted with the species. The meadow-fescue is also a valuable pasture grass. It is not as widely disseminated in this country as the blue-grass and wire-grass, but is quite common in the older settled districts of New York and New England.

As before remarked, the permanence of the sward in pastures depends much on the species of grass introduced, and hence it is important to obtain the best—such as are both hardy and nutritious. It is not always easy to obtain seed of the desired species. Fortunately, the blue-grass—which, in reference to all its properties, is the most valuable—comes in almost universally on good grass lands. The white clover is nearly as common, and though too much of it in a sward renders the feed more succulent than is desired, a mixture of it with blue-grass, or with wire-grass, makes excellent pasture for all kinds of stock. The grasses which are generally sown for meadows, or for hay, as timothy and red-top, are not the best for pastures. Timothy is not a very lasting grass, and either for meadows or pastures will not retain its vigor many years. Red-top is more enduring, but is not very nutritious. There are at least two well-defined varieties of what generally passes under the name of red-top, or the species *Agrostis vulgaris*. That commonly seen in this State is the large red-top, so called, in contradistinction to the small red-top, or "fine-top" of some sections. The former favors rather damp soils, where the stalks grow to the height of eighteen inches or more. The latter grows better on dry soils, and is in fact considered, in some of the Eastern States, as one of the best grasses for rather dry, loose soils. The stalks are small, twelve to fourteen inches in height, and more solid than those of the larger kind, and the grass for either grazing or hay, is considered more nutritious.

Considering the subject of pastures, in reference to all soils, it appears:

First. That on some soils, grasses will live but so short a time, that it is not an object to endeavor to continue them for permanent pastures. Such land, if suited to grain or other cultivated crops, may be brought under a system of rotation; if not, devoted to forest trees.

Second. That some soils may be kept permanently in grass by occasional scarifyings or harrowings, with top-dressings of suitable manures, and re-seeding, on the surface, spots where the sward becomes weakened.

Third. That some soils which are particularly natural to grass, if once set with the proper species, may be kept in pasture for an indefinine length of time, in many cases without manifest deterioration, though fertilizers,—as bones, ashes, plaster, &c.,—may be advantageously applied at intervals.

THE FACTORY SYSTEM OF CHEESE-MAKING.

The making of cheese by associated dairies, a system which originated in Oneida county, N. Y., has already been extended over a large portion of the Empire State, and has been adopted in various other States, and in the Canadian Provinces. It seems likely to be still more extensively adopted as its advantages become known. Allusion was made in my report for 1864, to the comparatively small amount of cheese made in Michigan, and it was suggested that the factory system of manufacture might be introduced and practiced in the State, with highly beneficial results. The subject has now attracted the attention of some of our farmers, and frequent inquiries are made in regard to the system, the manner of organizing companies, &c. As comprising a large amount of information relating to the manufacture of cheese, that may be useful to those engaged or about to engage in the business, either in a private way or by companies, the following selections from an address of X. A. Willard, Esq., before the New York State Cheese-Manufacturers' Association, at Utica, January, 1865, are herewith presented, to which is appended the constitution of the society, as a guide in the formation of similar associations. The title of the address is:

AMERICAN CHEESE-DAIRYING—THE MEANS FOR ITS IMPROVEMENT AND SUCCESS.

The Associated Dairies of New York now represent an immense capital. It is only a few years since we saw them first inaugurated on the soil of Oneida, attracting attention from their novelty, but looked upon with distrust by the old and experienced dairyman, who had no confidence in their successful operation. No effort has been made to force this system upon the public. It has marched forward on its own merits, and now obtains a foothold in the best dairy districts of the world. It has not only spread over New York, but has been carried into the Western States, New England and the Canadas, and the "goods" manufactured are becoming famous in the markets of Europe. If we look into the causes of this success, we shall find that it rests on no ephemeral foundation, but has a substantial basis that commends itself to the dairy public, that must soon supplant the old order of cheese dairying, and drive it from the land.

I am not prepared to say that factories exhibit any more skill in manufacture than is found in some of the private dairies, nor is it pretended that any better quality or larger quantity of cheese can be made; but that it is quite equal to the best, more uniform and brings a higher price, is beyond dispute. These are arguments of great power, which are constantly at work, pushing a factory here and there in the old dairy districts, and thus gradually undermining the family cheese-making.

The advantages of association in the conduct and management of manufactures and arts, lying in those channels where associated capital has been employed, are pretty generally understood and appreciated by the public; but the farmer has, for the most part, supposed his business to be of a character that would not easily adapt itself to this principle. He has, therefore, been content to limit his efforts to the production of the raw-material—growing his wheat, his wool, his flax, together with other products of the soil, and disposing of his surplus as best he could, to be manufactured and marketed by associated capital and labor.

It is not proposed just here to discuss at length the question of economy on the part of the farmer in this arrangement. The manufacture of some of his staples might, perhaps, require too much capital, and be surrounded by a complicated system of management, demanding financial skill and executive ability of an order not easily secured, involving, too, more hazard than is congenial to those used only to farm life; yet there are others of a character so readily fitted for market, that neighboring farmers, by associating together, it would seem, could adopt a system without any risk or outlay of capital, and thus secure to themselves the profit of manufacture, which in most instances exceeds that of growing the raw material.

" *Protective Advantages of Association.*—The inauguration of Associated Dairies is rapidly producing a revolution in old customs, and in heretofore fixed ideas. It teaches the important lesson that farmers can adopt successfully the same means that have proved so beneficial to the merchant, the banker, and the commercial man of the world. By a consolidation of interests the dairyman of to-day can wield a power and influence never before reached. The vast capital, in lands and herds is of a substantial and pemanent character, while the aggregate product of the farms, annually amounting in value to millions of dollars, compels respect from those who would assume that the proper province of the farmer was merely to till the soil, leaving for others to divide the profits realized in marketing his productions. It has been suggested that an arrangement could be made by which leading European houses would take choice factory brands, direct from the producer, and advance through an agent in New York, the stipulated price. Whether more could be realized in this way than by the present system, under which the country buyer gets one commission, the house in New York another, and the shipper a third, is a matter that needs investigation.

"Railroad corporations now dictate to you the prices for moving your goods to the seaboard; yet by united action, this great source of income would be swept from their hands, and transportation made by water at half the cost. Under the improved system of ventilation adopted in canal boats, cheese could be carried to New York, it is believed, in as perfect condition as by rail; and it is a question for you to determine whether you will longer submit to these exactions.

But the dairyman, with his herd of fifty or one hundred cows, standing alone, has a circle of influence whose radius extends but little beyond his farm. He is, in a measure, at the mercy of corporations and speculators, who, by operating together, may fix prices and control the trade. When associated with others, in neighborhoods, in towns, in counties, and in the State, he becomes formidable, and meets on equal terms, the community of dealers with whom he is operating.

Permanency of the System.—The questions have been frequently asked—Is the Factory system destined to stand the test of years? Is it to continue to prosper, or will it soon break up, and dairymen return again to the old order of cheese-making? In my opinion it is to live. The system is a progressive step; and all history teaches that when that is taken it is difficult to retrace the step. Doubtless some of you remember when the wool and the flax grown on the farm were spun and woven in the family. We shall never return to that again, because we cannot afford it. They can be more cheaply manufactured by associated capital, or where the untiring arm of the machine is substituted for that of the living muscle. The flesh and blood of our wives and daughters are of too much consequence to be worn out by this ceaseless toil, when the spindles and looms, driven by steam or water power, can relieve them of the burthen at a fraction of what it costs in home manufacture. Why, then, should a neighborhood of dairymen do the work of cheese-making in families, employing many hands, when it can be performed equally well by a half-dozen persons in a well constructed factory?

Old Districts unfavoradly affected—a Foreign Market now Demanded.—But it is claimed, there is one feature with regard to these cheese associations that operates injuriously on the interests of old dairy districts. Cheese dairying is no longer a privileged business, narrowed down to a few places, where high skill in manufacture has built up an enviable reputation. It is opened up to many localities. What you have been acquiring by long years of patient toil, by science and experience, is at once opened to whole communities, where the art of manufacture is unknown. They come here and pick off your best cheese-makers—they erect their factories and meet you in the market on an equality. So long as dairying was conducted on the old system this could only be done slowly, and so gradually as not to influence the trade for years. Doubtless in this respect the factories act unfavorably on those who would prefer to see dairying confined within narrow limits; and the fears that the business may be overdone, are not altogether groundless. But the step has been taken, and it is too late now to look back. It remains for us to make a market sufficiently large to take all our "goods." In what manner this can be done is obvious. The quality of American cheese must be improved so that it will be sought after on this account in all the markets of Europe. There is no reason why American factory cheese may not become as noted in its line as the wines of Johannisburg, the porcelain of Sevres, the sword blades of Damascus, or the shawls of Cashmere. We can compete with the dairymen of the old world as to prices, and when we shall be able to outdo them in quality, a market for our goods is secured for all coming time. The business of cheese dairying is now ussuming large proportions, and will still increase rapidly, under the stimulus of ready sales, high prices and the facilities offered for manufacture under the factory system. How far this influx of the business is to influence prices remains to be seen. Without a market in Europe, the supply, it is evident, will be so great as to glut the home trade, and render cheese dairying unprofitable. It is true, nature seems to have hedged the dairy within certain limits. The immense plains of the West and South, as well as large portions of the Middle States, are not adapted to dairying. The lands are deficient in springs and streams of living water, the soil is of such a character that grasses soon run out, and pastures become brown and dried up, or afford scanty herbage long before midsummer. These lands are better adapted to wheat and corn or the production of beef or mutton or wool, and hence will not naturally be employed for the dairy. But still there are large tracts of land suitable for milch cows, and should they be generally devoted to the dairy we may possibly find the annual supply of cheese so great as to sensibly affect prices. There is no question of more importance, none of more vital interest to the dairyman than this matter of market—a market that is permanent, enduring and remunerative.

Prices and Quality of American and English Cheese.—American cheese has been greatly improved within the last half dozen years, but the average of our factory cheese is still below the English standard of first class Cheddar. I am aware that this subject of quality is a delicate question, requiring some caution in its handling. It is natural for every cheesemaker to fancy his own manufacture quite equal or a little superior, perhaps, to that of others. Dairymen are often very sensitive and take it hard if a word of disparagement is offered in reference to their dairies; but we must not gloss over facts. The celebrated Cheddar cheese of England sells in advance of ours. It has been sold in the London market at wholesale at from 84 to 112 shillings per hundred weight, or from 17 to 24c. per pound in gold, while choice American cheese commanded from 62 to 65 shillings, a little more than half price. Why is this?

According to the analysis of American cheese, made by Dr. Voelcker, for the Royal Agricultural Society, it appears that our cheese is not wanting in richness, having nearly 36 per cent. of butter, and more of that material with less water than the English Cheddar, but the great fault complained of, was deficiency of flavor, and also want of solidity.

While duly acknowledging the late improved character of factory brands, he remarks that in his examination of American cheese, he is led to conclude, 'judging from our importations that good materials are even more thoroughly spoiled on the other side of the Atlantic than in England.' With regard to the importance of attending to the condition which insures fineness of flavor, when making cheese for the English market, the following extract written by a noted London dealer to a friend in Ayrshire, is worthy of a place in this connection. He says:

"I am engaged in selling large quantities of Cheddar cheese from Scotland, and you will do a benefit to the producers if you urge upon them to attend to the condition of the evening's milk in the morning, and also to attend particularly to the ripening process. These two matters affect flavor, and *flavor* is everything if a high price is aimed at. I sold in London, yesterday, the produce of two dairies equally rich, yet the one was 22s ($5 50) per hundred weight higher than the other."

"Now, there is no reason why our factories should not be able to meet all the conditions of the English market, as to flavor and high priced cheese—they have greatly improved the character of American cheese, and by united and presistent effort this point *can and must* be reached. I learn from dealers that the point has been nearly or quite reached by some of our factories, the past season, and if the statement be correct, we can see our way more clearly in the future, for we can manufacture and sell our cheese in England for what it costs there in the mere production of milk. According to Morton's Cyclopeda of Agriculture, the cost of producing a gallon of milk in Gloucestershire is 6⅛ pence, or 12¼ cents, while in Cheshire it is 13 cents. It will be seen then how large a margin is left them to compete with us in the manufacture of cheese.

What they fear and say of us across the Atlantic.—It is the fear of our success in this direction, that has alarmed the cheese-makers of the Old World. They already see their business slipping away and only hope that we may not be able to compete with them in quality and flavor on a larger scale. At the great show of dairy products at the exhibition of the Ayrshire Association, in 1862, which was largely represented by leading men from all parts of the United Kingdom, Mr. Bowles, of London, said: "He wished to impress on the cheese-makers of Ayrshire and Scotland that they should endeavor to beat his own countrymen, the Cheddar Dairymen. He could assure them that in London, there was no demand for inferior goods. They had a better demand for American dairy products than for indifferent lots of home manufacture. It was quite useless for the farmers of Scotland to compete with the farmers of America, except in one way, and that was by making a better article. In London there was always a steady, active demand for fine goods, which could always command a large price. To show that he was right as to the inexpediency of Scottish farmers competing with their agricultural brethren across the Atlantic, unless they provide a first rate article, he might tell them that from the 1st of January, 1861, ending December 31st, there were imported 716,673 boxes of American cheese, equal to 45,000 tons. This year the importations were on the increase. For nine months closing the 30th September, 1861, the imports were 447,678 boxes, equal to 28,000 tons, while for the same period of 1862, the numbers were 50,317 boxes, equal to 31,000 tons—showing an increase of 3,000 tons over the corresponding period of last year. These figures plainly proved that competition was futile unless the Scottish cheesemakers could turn out a superior article. He would also take leave to say that in London they had a greater demand for colored than for pale cheese." &c., &c.

Flavor Injuriously Affected—How Removed.—It has been shown that one of the leading faults in American cheese is its deficiency in flavor. In what way can this be remedied and improved, now demands the serious attention of the dairy public. I am not disposed to underrate the improvements that have been made in factory buildings and in cheese manufacture. Great as they have been, and much as is due to the late Jesse Williams and the dairymen of Oneida for their efforts in perfecting the factory system, there is still room for further improvement.

The old factories need remodeling. The new factories should be constructed with particular reference to cleanliness, the avoidance of all taints about the buildings likely to be absorbed by the milk or cheese; and finally, an arrangement of the dry-house, so that some uniformity of temperature be preserved while the cheese is undergoing the process of curing. There are a large number of factories where no attention is paid to these conditions. Whatever wonderful skill is exercised in the management of the milk and in its manufacture into cheese, how is it possible to obtain sweet, clean, and high flavor from milk reeking in emanations from the pig-sty, the stench of putrid whey, or the odors arising from decomposing slops? How is it possible to obtain high flavored cheese in dry-houses so arranged, that no uniformity of temperature is preserved from day to day, in a climate like ours, where the themometer frequently varies from 20 to 30 degrees in twenty-four hours?

My friends, I belong to your class, and am interested in the success of American Cheese Dairying, and I say to you, earnestly and in good faith, that you are asking too much from the manufacturer, to require him to furnish high priced cheese from imperfect milk—milk that is feverish or diseased, or mingled with filth before it leaves the stables. Cleanliness is one of the virtues and it is imperatively demanded in the production of nice flavored cheese, to say nothing of the vice of forcing on consumers unclean food arising from carelessness or inattention on your part.

Dogs are a curse among the herds, not only lessening the quantity but injuring the quality of milk. It is well known that milk heated and feverish from over-driving cows in hot weather, is not a healthy article of food. Cows that are kicked and abused will not secrete good milk, and I have yet to learn that there has been any process of cheese manufacture invented that can convert diseased milk into a healthy diet. Matters of this character should be attended to in every association. Each member should be required to furnish good, clean, healthy milk, with as much watchfulness and care as water dilutions are guarded against.

These are some of the causes that influence flavor. There are others, such as food, water, neglect of salting, &c., &c.,

which need not be considered in this place. I may remark, however, that Mr. Farrington, for many years, a cheese dealer in Herkimer county, and a noted expert in the cheese trade, has affirmed that he could detect the daisy taint in cheese, and was able to tell (with the "tryer," at the store-house,) when the cheese had been produced on farms overrun with this weed. Leeks, cabbages and turnips give a taint to milk and butter, and it must be evident that this influence of food extends also to cheese.

But a radical change should be introduced in the dry-house. Its location in a pure atmosphere, with thorough ventilation to carry off noxious emanations that are arising from the cheese during its process of curing, are not the only improvements demanded. Temperature should be under control so that fermentation may be carried on with uniformity. It has been claimed that the superiority of English cheese is due in a great measure to the even temperature of the climate, and yet with all this advantage of climate, the Cheddar dairymen pay more attention to the ripening process of their cheese than is done at the American factories. The use of the thermometer is as necessary in the dry-house, as in the milk-room. Large quantities of well made cheese are badly spoiled in curing. When the weather is just right, the curing process goes on without much trouble, but when it is variable, with extremes of heat and cold, damp and dry weather following in rapid succession, the cheese is more or less out of flavor, and no after treatment will be able to correct the difficulty. The dry-house should not only be arranged with ventilators at the ceiling and wickets at the floors, giving free communication with the air outside, but it should be so constructed, that a low even temperature be preserved in hot as well as cold weather. The temperature best adapted to curing cheese in order to secure fine flavor is from 65 to 70 degrees.

The Cheddar Style.—We have alluded to quality and high flavor as essential to success. It may be well to define the character of cheese sought for in the London markets. Formerly there was a variety of styles held in greater or less repute in the English markets—The Stilton, the Dunlop, the Cheshire, the Gloucester, and some other varieties—but now all these are giving place to the *Improved Cheddar*, which under the teachings of Mr. Harding, of Somersetshire, has become famous throughout the length and breadth of Britain. It is unquestionably the highest grade of cheese produced, or at least it best satisfies the English taste, and as England is our largest customer, it is important that we pay attention to, and humor that taste. The best American cheese, as now manufactured, resembles it in quality and flavor, but differs from it in shape, the Cheddar being 12½ inches high by 15½ inches broad, and when larger, in the same proportion. A suggestion here occurs which may as well be disposed of in this place. It is this: Why not adopt the English style as to shape? The Improved Cheddar has acquired a high reputation, and if our customers are better pleased, or can fancy our "goods" are of a nicer quality by being put up in a favorite style, there is no harm in gratifying them, so long as they are willing and able to pay for it. It is a foolish matter to attempt to combat prejudices when there is no principle involved, and nothing to be gained in a moral or commercial point of view. The impression prevails, that could this style be adopted by our factories, our sales would be improved from one-half to a penny per pound; and it is a matter that deserves your attention and consideration.

Comparative Advantages of the Cheddar Process.—In a prize essay by Mr. Fulton, "On the best mode of making Dunlop and Cheddar Cheese, and the comparative advantages of these two varieties," published in the transactions of the "Scottish Highland and Agricultural Society," the writer, after referring to both methods at length, goes on to say:

"As to the difference of these two varieties, the reader will perceive that as regards the mechanical part of the process, the Cheddar is the more simple. The difference, however, is not to be found in the operations, but in the chemical conditions, or in its application of those examples which operate upon the milk and affect the chemical and physical character of the cheese, viz: Rennet, acidity and temperature, all of which, although producing different results, are to a certain extent equivalent to, or substitutes for one another in coagulating energy. In the Dunlop, coagulation is effected rapidly, with a large quantity of rennet, at a high temperature, and an alkaline or neutral condition of the milk; in the Cheddar, coagulation is slowly effected, with a small quantity of rennet at a low temperature in presence of a free acid, or an acid reaction of the milk, thus inducing at the very commencement different changes, which are further effected by the modes of separating the whey. In so far, therefore, as the separation of the whey is concerned, the Dunlop may be said to be a mechanical, the Cheddar a chemical process. As to the comparative advantages of these two varieties, the reporter, after a careful investigation, has come to the conclusion arrived at by all who have fairly tried both modes, that the advantages are wholly on the side of the Cheddar.

"These advantages, which are of an economical, dietetic and commercial character, may be stated to be saving of labor, the production from the milk of a larger quantity and a better quality of cheese, which sells in the general market in an average of years at about $100 per ton more than the Dunlop. This very year, 1858, while the farmers' price for Dunlop was only from £48 to £50 per ton, Mr. Harding, at the same period sold his cheese at nearly £80 ($400) per ton. So much for the commercial advantages.

"In regard to the dietetic, the too energetic coagulation and the mechanical force employed in separating the whey, cause the smothered fermentation, which produces the crude quality and tenacity of texture characteristic of Dunlop cheese, which make it so insoluble and difficult to digest.

"The gentle coagulation and acid reaction of the milk, together with chemical means in separating the whey, give the Cheddar its rich appearance and quality, and that peculiar mellow texture which renders it so soluble and easy of digestion, and consequently more nutritive than the Dunlop.

"The flavor or relish is supposed to be due in some measure to the delicious aroma of the whey, developed in the heating and absorbed by the curd in the process of 'scalding.' A full and fine flavor might be imparted by distilling off the aroma of the whey and adding it to the curd when being made up into cheese.

"As to the economical advantages, the mode in which the saving of labor is effected will readily occur to the reader. The larger quantity, as determined by experiment, probably arises from the presence of a free acid in the milk, which, acting as an additional coagulating agent, either assists or coagulates some substance in the milk not coagulable by the rennet, or in an alkaline or neutral condition, and thus precipitates from the milk a larger quantity of curd; at least the curd relinquishes more readily its attraction for the whey, which comes away more thin and limpid than the Dunlop.

"The larger quantity also arises from the substance of the curd not being forced out in the form of white whey, as takes place in the Dunlop, by the excessive manipulation and pressing in the dreeper. In the Cheddar there is likewise a better combination of the caseous and butyraceous constituents than what obtains in Dunlop, which accounts for its more stable character.

"In the manufacture, the dairy-maid finds less oil in the whey—the cheese stands ripening at a much higher temperature—and is better suited for export to warm countries.

"To ascertain the cause of these different qualities, belongs to the domain of chemistry; it may be mentioned that they are chiefly due to the result of some chemical change that takes place only when a free acid is present in the milk when it is set with the rennet."

The Cheddar Process.—In the improved Cheddar process adopted by Mr. Harding, of England, great attention is paid to the milk-house. It is constructed with reference to regulating temperature by admission or exclusion of air and exposing the milk to fresh and untainted atmosphere. The evening's meal of milk is cooled to 60 degrees or 62 degrees, and the highest temperature at which it should stand in the morning is 64 degrees. When the temperature is high in the evening, the milk is set thin in coolers and exposed to a free admission of air. The first act in the morning is to test the temperature of the evening's milk. If the temperature is above 62 degrees, the milk is allowed to remain in the plates or coolers until the morning's milk is put in the cheese-tub. But if the evening's milk is at, or under 62 degrees, it is lifted or seived through a fine cloth into the cheese-tub and the morning's milk added to it. When the temperature of the evening's milk is high in the morning, it is an indication that it is on its way towards acidity.

The testing of the cold milk by the thermometer, serves as a guide for the quantity of rennet needed for coagulation, as less is necessary when the evening's milk stands at a high temperature in the morning. In the Cheddar process of manufacture it is *preferred* that the milk be kept at a low temperature, and the acid (which is sour whey distinctly acid) to be applied directly to the milk at the time of adding the rennet.

Its use is to assist the rennet in the more complete conversion of the sugar of milk into lactic acid. When this is effected to a proper degree and no more, the acid passes away in the whey during pressing and in the cheese room, leaving the curd in a condition that will not only make the cheese produced more solid and close in texture, but richer, firmer, sweeter, and of greater specific gravity, than when the acid has not been present in a sufficient quantity. When the temperature of the cold milk is 64 degrees, no sour whey is used, the acid being present in a sufficient degree without it. In large dairies, less sour whey is needed in proportion to the milk than in small ones.

"The milk is set at 78 degrees, and if the temperature of the evening's milk has been kept at about 60 degrees, five quarts of sour whey, distinctly acid, is added to 165 gallons of milk, at the time of putting in the rennet, and coagulation is effected in from forty-five to sixty minutes. It is preferred that coagulation be perfected in so short a time, as there will be waste of richness if it is protracted.

"After the milk has stood fifteen minutes, the top or surface is gently stirred up with the fingers, to prevent the cream from ascending, and this is to be repeated if the curd is longer in beginning to form. As soon as it is sufficiently formed (and it is not allowed to get very firm), the operation of breaking is at once commenced, and is performed *carefully, gently, and minutely.* This is accomplished in about thirty minutes. Before the breaking is finished, the mass is raised by the addition of heated whey to 80 degrees. This additional heat not only keeps up the temperature, but hastens the separation of the whey from the curd, and assists in promoting the necessary acidity. The curd is now allowed to stand forty-five minutes (if the acid is not present in too great quantity), but when too much is present it is allowed to stand no longer than the time occupied in heating. When the curd has stood the proper time, the whey is drawn, till the surface of the curd appears, when the curd is carefully broken up and the temperature of the mass gradually raised to 100 degrees by the addition of heated whey. The length of time that stirring is continued is varied according to the state of the curd, from fifteen to twenty minutes (when rather acid), to twenty-five to thirty minutes when rather sweet. When the curd is sufficiently firm, it is in small particles like peas, firm, elastic to the touch, and when a portion is taken up and squeezed in the hand it does not readily adhere together, but separates in particles. The stirring is continued until the curd has the proper feel, without regard to the time occupied, and should then be given up, the temperature being 100 degrees, for if continued longer the cheese will be hard and stiff. This process of saturating the curd with the heated whey has the effect of completely separating the whey from it; the moisture which adheres to the particles, and which will come out under pressure, is all that is left. The curd when separated from the whey, in the manner described above, retaining all its natural richness, and the cheese produced has the sweet, nutty flavor, something like new milk, known as the *Cheddar flavor.*

"When the curd is only brought up to, or little over, the natural heat of milk, all the butter is retained, and fixed in the curd; for although subjected, even at first, to a pressure of half a ton, no trace of butter appears.

"After the curd has been allowed to remain, *undisturbed,* in the scald about thirty minutes, the separator is again inserted, and the whey run off.

"After the curd is thrown up into a heap in the centre of the cheese-tub, or on the side of the tub if it is flat-bottomed, it is then covered with a cloth and allowed to lie thirty minutes, the whey meanwhile flowing slowly from the heap. At the end of this time, it is cut across in large lumps, heaped up, and covered as before, and allowed to lie another thirty minutes, when it is taken out of the cheese-tub, laid upon a cooler, split by the hands into thin flakes, and spread out to cool. The curd at this stage has a distinct acid smell; its taste is slightly sour, and by no means palatable, and such as would lead a novice to think it unlikely to produce a fine cheese.

"When the curd is placed on the cooler (which is placed in the coolest part of the dairy) for ten minutes, it is turned over and allowed to lie the same length of time. It is afterwards put into a vat, having clean cloth inside, and put to press under a weight of half a ton. After having been subjected to this process for about ten minutes, it is taken out, ground in the mill, accurately weighed and returned to the cooler, where it is salted at the rate of one pound of salt to fifty-six of curd, and cooled down as near to sixty degrees as the temperature of the air will admit. In summer, it will not easily be reduced below sixty-five degrees; but no hurt will accrue from its being put into the vat at that temperature.

"The curd is then finally put into the hoop and under pressure of six hundred pounds. In the evening it is taken out of press, and a clean cloth put on it, the cheese being turned and put back to press under a pressure of half a ton. Next morning it is again taken out, and gets a dry cloth, is turned and put to press, with four hundred pounds additional pressure. On the following day it receives its third and last cloth, and is placed under an additional pressure of four hundred pounds. In the evening it is again taken from the press, gets a calico cap neatly stitched on it, and put under a pressure of one ton, until the following morning, when it is finally taken from the press, having remained under pressure for seventy-two hours."

Under this process during the month of August, 1860, the cheese produced from 1,634 pounds of milk, weighed 170 pounds, or a little less than a pound of cheese from nine of milk.

Character of Milk influenced by different Soils.—I wish to state a fact here which is not generally understood, which has not been discussed by writers on the Dairy. It is, that no set rules for manufacturing cheese can apply precisely in the same way in different localities, where the soils differ in character. The character of soil where cows are pastured has a curious influence on the milk, which is not understood, and cannot well be accounted for. Generally on high and dry pastures of gravelly loam, the milk will be more readily converted into cheese; that is, the curds do not require to lie so long in the whey, or scald, as where the milk is produced from low, wet grounds. The treatment of milk and curds, therefore, must be varied to meet the different character of soils, for that which would make good cheese in one locality, would make bad in another. So that manufacturers should understand this principle, and govern themselves accordingly.

Our Struggle for Supremacy must be with European Dairymen.—It will be remembered, so far as conveniences and appliances for the manufacture of cheese is concerned, the

Americans are now far in advance of the Europeans. If they have thus far been in advance of us in the production of fine cheese, we must remember also that their chemists and men of science, under patronage of the government, have for years labored in this cause, giving needful suggestions from time to time. But the American dairymen have been left without aid, to work out all the problems connected with the dairy. Whatever has been learned has been gained by patient toil, on the farm and in the cheese-room, unaided by any government patronage.

To the dairymen of Oneida and Herkimer counties, the country is mainly indebted for whatever of progress has been made in the art of cheese-dairying on this side of the Atlantic; and it now belongs to all the cheese-producing counties of the State, by a united effort, to bring the manufacture of this staple to the highest standard of excellence; self-preservation now demands it. We have let in the whole world to this factory system; and if low-priced cheese is to be the rule, we of the old dairy districts will not be able to compete with those of the new, on low priced lands. The business will be overdone, and *they* possibly may live, but we must go under. The struggle before us, if we would stand up and keep our business in the future, is with the dairymen of the Old World. To be able to furnish prime cheese to the Europeans at a less price than can be manufactured in Europe, is for their interest as well as ours. The dairymen of the Old World can profitably substitute the production of beef, and mutton, and wool, for that of cheese.

Dairying is now conducted in many of the counties of England and Scotland on an extensive scale. In Cheshire alone, where the actual cost of producing a gallon of milk is thirteen cents, there are more than forty thousand cows employed in cheese-dairying, and the annual product of cheese is twenty-eight millions of pounds.

Our Exports.—In 1857, the total exports of American cheese amounted to but 6,500,000 pounds, about 4,000,000 of which went to Great Britain, and the rest to other parts of the world. From September, 1858, to September, 1859, the exports of American cheese to Britain were a little more than 5,000,000 pounds. From September, 1859, to September, 1860, a trifle over 15,000,000 pounds. The exports from New York in 1860, were 23,252,000 pounds; and in 1861, 40,041,000 pounds. The product of cheese in the State in 1860, was 48,543,288 pounds, of which Herkimer made 10,901,522 pounds, Jefferson nearly 5,000,000, Lewis, 3,000,000, Madison and Montgomery over 2,500,000 each, Erie over 2,000,000, and Oneida over 3,500,000.

In 1863, from January 1st to October 25th, the exports of cheese, from New York alone, were 32,100,933 pounds, while for the corresponding period for the season just past, the exports were 38,557,711 pounds. Large quantities of cheese have been shipped since October 25th, and the total export of the year from New York, it is believed has been over 50,000,000 pounds.

The rapid rate at which cheese-dairying is being introduced must soon bring our exports up to more than 100,000,000 pounds. The total product of cheese made in the country I shall not attempt to estimate. Nine years ago, when our exports were mere nothing, the product was 105,535,219 pounds.

During the past year there has been scarcely a week or a day that I have not been in receipt of letters from nearly all the Western States, from Pennsylvania, and portions of our own State, asking information as to this factory system of cheese-dairying; and there can be no doubt but that new districts are about to enter largely into the business.

Since the above was written, through the courtesy of Mr. Burrell, of Herkimer county, a gentleman widely known in the cheese trade, I have been furnished with a statement made by Charles Taylor, showing the exports of cheese from New York for the two years last past. Mr. Taylor makes the year commence and end with October 1st, and hence we are not able to separate the two years, so as to show precisely what has been shipped since January 1st, 1864. He says: "The cheese exports from New York, from October 1st, 1862, to October 1st, 1863, were 35,541,650 pounds. From October 1st, 1863, to October 1st, 1864, 48,002,500 pounds; and from October 1st, 1864, to January 1st, 1865, 15,619,000 pounds; making 63,624,500 pounds for fifteen months, or from October 1st, 1863, to January 1st, 1865. But from the statistics furnished by the Custom House, and published in the bi-monthly report of the Commissioner of Agriculture, the exports of cheese from New York from January 1st, 1864, to October 25th, are stated to be 38,557,711 pounds. This, added to the exports given by Mr. Taylor, since October 1st and up to January, 1865, makes 54,176,711 pounds. So that by deducting the shipments for twenty-four days in October, we shall find our exports from New York, the past year, will not vary much from 50,000,000 pounds.' Mr. Taylor says: "The best American cheese, the past summer, brought 70 shillings per hundred, while the best English sold for 80 shillings."

In the adjoining county of Herkimer, there are four points where cheese is shipped by rail: Frankfort, Ilion, Herkimer, and Little Falls. At Little Falls alone, the shipments on the railroad, during the past season, have been nearly 6,000,000 pounds. Cheese has been shipped also from this point by canal, and there is yet a considerable quantity back. But taking that only which has been shipped by rail, and estimating sales at twenty cents per pound, we find that the farmers within a circuit of six or eight miles from town, have received $1,200,000. Add to this the other shipments which are back, the sales of whey-pork, the receipts from butter, 163,215 pounds, shipped by rail, amounting, at 45 cents per pound, to $73,446 75, besides supplying the village, with a population of five thousand, and it will be seen that this business of dairying is no mean affair, but is worth an effort to be made permanent and remunerative.

That the dairy interest of New York has been largely increased within the last five years, is shown by statistics furnished by the Department of Agriculture, as to the number of milch cows in the State in 1859 and 1864. In 1859 the number was 1,123,634, and in January, 1864, there were 1,220,200, or nearly 100,000 increase. Supposing this increase to be wholly devoted to cheese-dairying, and the annual product of each cow to be 500 pounds, we have 50,000,000 pounds of cheese as the increased product of 1864 over that of 1859.

Causes Influencing the Quality of Milk.—It has been remarked by Liebig, that cows driven long distances to pasture, unless they get an extra supply of food, yield milk poor in casein or cheesy matter; the materials which would otherwise have formed that constituent of the milk being used in repairing the waste of the muscles, and other parts employed in locomotion. This fact is lost sight of by many farmers. Herds that are compelled to travel long distances for water, or which are occupied a considerable portion of the day in getting a supply of food, yield less milk, and of a poorer quality, than when they can fill themselves quickly and lie down to rest, and manufacture their food into milk. In administering food to milch cows, the first consideration should be the maintenance of a healthy, robust condition. That secured, the increase and improvement of their milk may be realized by paying due attention, in securing quiet among the herds, and supplying the requisite food from which good milk may be realized.

Animal bodies consist principally of the following parts: Flesh or muscles, blood, fat, bones, skin and hair. To maintain such compound bodies in health, therefore, it is necessary to supply what is requisite to make good the continued loss which each of these parts is continually undergoing in the exescise of the nutritive process.

The albumen, casein, and other nitrogenized principles of food, supply the animals with the materials required for the formation of muscles and cartilage; they are therefore called flesh-forming principles.

Fat or oily matters of food, are used to lay on fat, or for the purpose of sustaining respiration. Starch, sugar and gum, and a few other non-nitrogenized substances, consisting of carbon, oxygen, and hydrogen, supply the carbon given off in respiration, or they are used in the productions of fat. Phosphates of lime and magnesia present the animal with the materials of which the bony skeleton of its body consists.

Saline substances, chlorides of sodium and potassium, sulphate and phosphate of potash and soda, and some other mineral matters, occurring in food, supply the blood, juice of flesh and various animal juices, with the necessary mineral constituents.

The healthy state of the animal can thus only be preserved by a mixed food, that is, food which contains all the proximate principles just noticed.

Starch, or sugar alone, cannot sustain the animal body, because they do not furnish the materials to build up the fleshy parts of the animal.

When fed on substances in which an insufficient quantity of phosphates occur, the animal becomes weak, because it does not find any bone-producing principles in its food.

The Originator of the Factory System.—In conclusion, a word will be pardoned in reference to the late Jesse L. Williams, of Rome. To him are we indebted for this system of Associated Dairies, one of the most remarkable steps in the history of progressive farming that has been taken in this wonderful age of new ideas. Of its beneficent results we can now scarcely form a correct estimate. The system was eminently his own. He lived to see shoots from the parent factory spring up rapidly about him, and spread their vigorous roots deeply through all the land; and wherever cheese-dairying shall be known in after-times, his name will be inseparably connected with its progress and success. His was no narrow and contracted spirit, that sought to cover up and hide the mysteries of his art for personal aggrandizement. He gave of his knowledge freely to all who came. He suggested improvements and advised gratuitously, so that others might steer clear of difficulties which had beset him, and which had only been conquered after years of trial and toil. Through his creative genius, Oneida county sprang at once to the head of the great dairy interest of the State; through him millions have been added to the permanent wealth of the country; and yet, modest and unassuming, he claimed none of the honors pertaining to a splendid achievement and a grand success. Stricken down by paralysis, almost on the eve of the meeting of this convention, we miss here his presence and his counsels. Born and reared on the farm, farming was a profession which he ennobled. As a good citizen, he identified himself with the interests of his town and county, and whenever a worthy object could be promoted by his assistance, earnest and active coöperation on his part was not wanting. His indomitable will and energy overcame obstacles that seemed formidable to other men, and whatever he put his hand to do he accomplished. Just, kind, charitable, loved and respected by those who knew him, he has passed away universally regretted. Not an aspirant of fame or the world's empty honors, he but sought to do the work assigned him with cheerfulness and Christian fortitude. He reached "the end," leaving behind a long record of shining virtues which the great in power and station might well copy as a legacy.

ARTICLES OF ASSOCIATION.—*Whereas,* It is deemed expedient to organize an Association through which, as a medium, results of the practical experience of dairymen may be gathered and disseminated to the dairying community; therefore,

Resolved, That we, the undersigned, do hereby associate ourselves together for mutual improvement in the science of cheese-making, and more efficient action in promoting the general interest of the dairying community.

ARTICLE I. The name of the organization shall be "The New York State Cheese-Manufacturers' Association."

ART. II. The Officers of the Association shall consist of a President, ten Vice-Presidents, Secretary, and Treasurer.

ART. III. The President, Vice Presidents, Secretary and Treasurer, shall constitute the Executive Board of the Association.

ART. IV. The officers of the Association shall be elected at the regular annual meeting, and shall hold their offices until their successors are chosen.

ART. V. The regular annual meeting shall occur on the second Wednesday in January of each year, at such place as the Executive Board shall designate.

ART. VI. Any person may become a member of the Association, and be entitled to all its benefits, by the annual payment of two dollars.

ENGLISH CHEESE AS COMPARED WITH AMERICAN.

It may be well to add to the foregoing remarks, a portion of those made at the last meeting of the Cheese-Manufacturers' Association, at Utica, N. Y., by Mr. Powell, of Herkimer county, who visited England in the summer of 1865, for the purpose of obtaining information in regard to the manufacture of cheese. In introducing his main subject, he said he formerly believed that the superiority claimed for English over American cheese, was the result of prejudice, or the defaming reports of interested dealers. He resolved to investigate the matter—to ascertain whether English cheese was really superior, and if so, from what cause. The main points to which he directed his attention will appear from the following summary, taken from the Utica Herald:

Requirements of the Trade.—Upon this point I have words of encouragement for the American cheese-producer. The demand for cheese must, in my opinion, more than keep pace with the possibility of supply, which will raise the market value of the product. In England the price of cheese the last year was below that of other prime necessities of provisions, which must have given an impetus to its consumption, and as the amount of other products, as beef, bacon and corn, was much less than usual, the price of them must advance, and with them that of cheese. Again, the home production of cheese in England must fall off, from the effects of the mortality among the herds. Many dairies have been wholly swept away by the ravages of disease, and everywhere the excitement was very great while I was in England. From one end of the Island to the other, reports were coming in of its advance from one point to another. Already 34,000 head have died, and the disease seems to be spreading. And every death by the scourge, whether beef cattle or milch cows, takes one from the dairy either directly or indirectly. I would not rejoice at another's misfortune, but when we look upon these facts there can be do doubt of a great demand for American cheese. And scarcity and high prices of other articles, with a corresponding falling off of home products, must have their effects upon the price to be paid for the article in English markets.

I do not affirm that more money will be received of necessity, for as the monetary affairs of our country become better, the disparagement of our currency lessens, consequently exchange and the price of gold must go down, so that if the price remains the same it will be relatively better. But if gold and exchange are at the rates of last season, we may confidently expect higher prices, for we may reasonably expect the demand to increase, and if we can furnish such goods as the tastes of the consumer demands, he will willingly give a better return.

Peculiarities of Tastes.—What are these peculiarities of taste is one question before us, and which I will, to the best of my ability, elucidate. The reason for almost every difference of taste was a subject of inquiry while in England, and I shall try to make them plain so far as I could secure light upon the subject. Thus far the American cheese-maker has been laboring in the dark. Ever willing to do all in his power and knowledge, he has made large, or returned to small cheeses, as the demand has been for the one or the other.

Many have become disheartened and have begun to believe that these demands are but the stories of interested dealers, gotten up for the purpose of securing the goods at a lower price. And well may he conceive this to be the case when no reason is given, other than the simple one, "the trade demands it." "But why does the trade demand it?" was asked with true Yankee persistence, and no reasons were given in reply. I am aware that a few years ago the call was for large cheeses, while it is now for medium or small. I will venture to solve this problem by giving reasons based upon observations and inquiries here and abroad. Within a few years, the demand for exportation has sprung up, and almost simultaneously the business of cheese-making has undergone a very great change, I may say revolution. Within these few years, or when exportation first commenced, nearly all the cheese was the product of private dairies, and unquestionably the best cheese was made by those having the greatest number of cows, for having more at stake, more care and attention was given the matter of its manufacture. Investigation and study gave them an advantage over small dairymen, who could not of a necessity afford to pay that attention to the subject which it deserves, or the time necessary to secure first-class cheese.

Now the English dealer, noting the fact of the superior quality of our large cheeses, sends word across the water to have large cheeses sent him. It was reasonable. The goods were better. The demand was made, and the price for such cheese raised in proportion. To secure these results of size and price, I presume, was the main impetus in the factory system as it now stands. The factories were instituted—absorbing both large and small dairies, to some extent—and there is a greater uniformity of size and quality. The original small dairy cheeses have almost entirely disappeared from the market, and still the cheeses are not of the size and shape required by the market; nor have the large cheeses ever been of themselves. The dealer has only chosen the least of two evils. And now the factories have been built, they ask: 'Why, after the advancement made in other respects, can you not give us cheeses of the size and shape called for?' We can, and if we are wise and would secure the highest price, we must.

The Size Required.—The size and shape of cheese are important in themselves, though that of size much less than shape. Mr. Bate, of Chester, said, 'with cheese equal in other respects, the size is a minor consideration, but they demand them in the Cheddar or Cheshire style.' In London I was told that of cheese of the proper quality, one weighing 60 to 65 pounds would out-sell, by four shillings a hundred, one weighing 85 pounds. Another dealer said that 'cutters of cheeses who call for those weighing 65 pounds, will not spend time to look at cheeses weighing 85 pounds.' Yet this, they claim, is of less importance than the shape, and I am inclined to believe that a variety of sizes is best for all concerned, as the demand for different sizes is such as to make an unvarying size a drug. Cheeses, I believe, may be made of all weights, from 50 to 100 pounds, and come within the range of an active demand. Over the last weight is a positive detriment.

The Shape Demanded.—The shape called for is one of those points in which, so far, the American cheese has been deficient. You all know the general proportions of English cheeses, Cheshire and Cheddar, being alike in this respect. The cheeses are 12½ inches high, by 15½ inches in diameter, or in like proportion for any diminution of size. I believe I never saw larger. We have been accustomed to large flat cheeses, 20 to 23 inches in diameter, with a depth of 8 to 12 inches, and weighing from one to two hundred pounds. Now the reduction to 18 inches does not remedy this evil, and factory men make a mistake when they stop at that size. It is better, but still the size of the cheese is not right. I know that this size is claimed to be medium, and that large or small cheeses can be pressed in the same hoop. But you see how you fail to secure what is demanded. If you make a cheese of the proper weight, it is too flat; if of the proper height, it is too heavy; so that you suit in neither case.

You ask, are there any good reasons for the demand for this style of cheese? There are, and very good ones. The English cheese-cutter and consumer are both interested in having cheeses small and high, growing out of the manner in which cheeses are cut on the counter.

When the cheese is placed on the block it is cut through two diameters at right angles, dividing the cheese into quarters. Then these fourths are turned down and cut parallel with the flat surfaces. This is the manner in which it is cut, and the portions thus made are firm, compact, and not liable to breakage, nor is there so much surface exposed to the action of the air. Now to increase the diameter of the cheese leads to one of two results. To secure a few pounds of the article it must be cut very thin through the parallel way, or else it must be again divided upon a diameter which causes the portions near the center to be very thin or wedge-shaped. In either case the buyer has a piece which has much more surface exposed to the action of the air, than when in a more condensed and firm body, besides the loss sustained by the consequent greater breakage of the thin portions. These are reasons of weighty import, and as they are founded upon sound principles of economy and long usage, it is useless to contend that they are mere whims. And as the reasons are good, we should be willing to accede to them.

Color.—The demand for colored cheese is one of great importance, though not perhaps, founded upon so sound principles. Long usage, and a desire to have a rich-appearing article, are the reasons assigned for this taste. Originally introduced to secure this last result, it has become of real importance. You ask, is a high, low or medium color demanded, and what is the shade? You are anxious to know, for you have gone from one point to another, and yet the buyers complain. One is suited by one thing, and another by another, while the same buyers change their opinions as they hear complaints of one shipment and another. As there is no minor point which causes so much complaint, or which is so perplexing; and yet it is a question of easy solution. The shade asked for is that of rich grass butter, neither lemon, orange or the lamentable red, so prevalent in American cheese. As yet there is no preparation in our country that secures the color required. The crude annatto, when prepared by the cheese-makers themselves, gives, as you are all aware, when exposed to the air, a reddish cast, while that commonly known as Jones's English Annatto, gives a color equally objectionable. Infused in small quantities, it gives a mustard shade; if in large, that of a lemon peel. Now, the amount of color used, I am convinced, is not of so much importance as the shade secured. That of rich butter is required, and whether it be high or low, a butter-color is demanded, and till that is secured we shall not please the English taste.

Bandages.—If we could manufacture our cheese so as to have no bandages when sent to market, it would be a great help to its sale. Not that the cheese is any better, but because the bandages are "tell-tales," constantly and everywhere repeating "Yankee, Yankee," and many consumers object to the use of American cheese, who can distinguish it by no other test.

Boxes.—The boxes used for shipping cheese, as they are now made, are poor in the extreme. Many of them fall to pieces, many are broken in the multitudinous handlings, and before dispensed with are almost a nuisance. They should be heavier in hoop, bands and heading, as well as better made. And the boards used between cheese and box should be much thicker than those now furnished. Nails are driven through the rim of the box and penetrate the cheese, and often before the cheese can be removed from the box the corners are torn and broken so as to injure the cheese, and often to waste portions of it. These suggestions in reference to boxes I give for the benefit of box-makers and shippers, as they are things not properly coming before the cheese-maker.

Other Requirements.—The other requirements are of such a nature that I shall feel at liberty to quote from authorities in England, as well as to give the results of my observations there, even though I should repeat part of the address delivered by Mr. Willard before you last year. Mr. Corderoy, of London, says, "We want cheese rich, solid, fine flavored, firm, sound, handsome, and that will go on to improve for twelve months, or longer if required." Mr. Bate, of Cheshire, says, "The best cheeses made are firm and imperishable, keeping in the farmer's cheese-room for twelve months or longer; the texture is solid, but not tough, and the flavor fine." Mr. Titley, of Bath, says, "The characteristics of a good cheese are mellow and rich in taste and flavor, and firm and full in texture." Mr. Joseph Harding, Somerset, says, "A good cheese is close and firm in texture, yet mellow; in character or quality it is rich, with a tendency to melt in the mouth; the flavor full and fine, approaching to that of a hazelnut."

These quotations are taken from a little pamphlet published by Mr. Robert McAdam, of Gorsty Hill. The object for which Mr. McAdam secured these opinions was not perhaps fully attained, but we are, by the publication of the pamphlet, enabled to see something of the requirements of the trade. Mr. Corderoy speaks of solid, firm and sound, as of three distinct qualities, and well he may. Solid in that it is not porous, firm in that it is not soft or waxy; sound in that is not cracked or broken. Rich cheese is demanded, and poor is not called for. Mr. Bate says "firm and imperishable." Cracked cheese is perishable. "The texture solid but not tough." Poor cheese is apt to be tough. Mr. Harding says, "close and firm in texture." That is, it is without porousness, and is not soft, while yet it is mellow. "In character or quality it is rich." Quality, as a requisite, is a single point, and means the buttery or oily appearance as in the meat of any good flavored nut, as the hickory, butternut or the hazel. My remaining observations upon the subject of requirements of the trade, I will put under the heads of texture, flavor, quality and preservation.

Texture.—The texture of the cheese demanded is that of a smooth, solid mass, without holes of any kind, so that when cut it will not have the appearance of having been made in pieces and soldered together afterwards. English cheese does not always have the appearance required, but when it is lacking the texture, is always condemned. Indeed, the compactness required is that of beeswax or wax candles.

Flavor.—The flavor is a peculiar point to decide and to secure. In whatever other respect a cheese may be good, to fail here is to ruin its chances for a high price. To be strong, to be bitter, to be insipid, to be negative in flavor, is equal to overthrowing all chances for favor. The flavor required is that nutty flavor which arises from the continuance of the new milk taste through all the manifestations of the process of manufacture, and which is retained after the curing has been accomplished. Not only must it be that flavor, but it must be distinct, sweet and full.

Quality.—Quality as a leading requirement is one of those points which it is well for us to consider. The term as used here and across the water is not precisely alike. There it means only one requirement, here it has a much wider range, embracing all the requirements. We say of a cheese, good quality or bad quality, and conceive the one first-class or excellent, the other as poor or inferior. But quality, as talked of there, is so nicely discriminated and so separate from the other wants in a cheese as to have a cluster of terms around it, as plenty of quality, good quality, poor quality, indifferent quality, &c. In itself it is richness or fullness of the cream or butter of the milk. This richness must be such that it can be recognized and appreciated without its giving a greasy or soft feel to the cheese when taken in the fingers, but which must be recognized on the palate, heightening and improving the flavor, while it makes more soluble in the mouth and more easy of digestion. Skimmed cheese is termed poor because the word is the opposite of rich, and rich means buttery or creamy cheese.

Preservation.—The requirement of a cheese that will keep for a long time in the hands of a maker or buyer, is one of the utmost importance, and one in which American cheese is lamentably deficient. The dealer has upon his shelves the product of a large number of dairies, and to have them he invests vast sums of money. Selling cheese is not always so easy a task as buying, and cheese is often a long time in the hands of the dealer. The stock must be bought when it can from the dairyman, and sold when called for by the consumer, and though the dealer is financially sure that his whole stock will in the end be bought and consumed, yet if the article perishes on his hands he loses so much as he might have sold it for if it had remained good. The loss is not only a direct loss to the dealer, but also to the consumer, which must act back upon the producer, for the dealer must and will buy cheaper or not at all, of articles that he cannot be certain of bringing the value given, unless immediately sold.

When in England in September and October, I saw cheese on sale that was made as early as the middle of May, and even earlier, and there was but a chance of its being disposed of for two months after that time, and that cheese was some of it going to decay from age. The dealer being perfectly aware of the fact of a decay from this cause, buys accordingly, and the producer must not complain if he does. If it can be remedied it should be.

I have now gone over the principal requirements and demands of the trade and will turn to the two principal processes of manufacture of cheese in England, leaving for the last part of my report my observations upon American cheese. The two kinds of cheese now made for the English trade, likely at all to come in competition with our own, are the Cheshire and Cheddar.

Cheshire Cheese.—The Cheshire chanced to come first under my observation and I will give you the results of such observation in as brief a manner as possible. While in England, I visited with Mr. Morrison, a cutter of cheese, who, on being told my mission to England, said, "he does not want to go to Cheshire to learn to make cheese, they have forgotten how." I am inclined to think him mistaken. They make cheese by their method as good as that made thirty years ago, and, doubtless, better, but they have not kept pace with the improved tastes of the consumer.

Cheshire, the first county visited, is rather level—still there are some hills and some bottom lands. The soil is a heavy clay, upon the higher grounds, and black bottom grounds or deposits in the valleys, the substratum being limestone. Here is made the famous Cheshire cheese, that a few years ago stood unrivaled in the markets. The dairies visited varied in number of cows from forty-two to seventy-five. The buildings and out-houses are all remarkably well kept, great care being taken to secure cleanliness and pure air for the cows. The Cheshire cheese made at the places where I visited is counted of the very highest character, and brings a very high price.

Cheshire Process.—The process is entirely different from our own, and is worth glancing at, though I do not conceive it would benefit us to adopt it here. The night's milk is spread very thin in dishes on the stone floor of the milk-room, or in some other way, so as to secure a low temperature without the necessity of stirring. In the morning it is put into the tub with the morning's milk, and the whole set to coagulate at a low temperature, and stirred from time to time till coagulation commences—coagulation being long in taking place. After the cheese has come, the upper portion is cut or partially turned over upon the remainder of the mass. It now stands till the whey appears upon the top of the curd. It is at this point cut very fine with a wire sieve cutter, when it is allowed to settle. After it has settled sufficiently, the whey is dipped off, and this dipping is continued as long as any can be got from the mass in this way. It is now put into a drainer, and a slight pressure put upon it. It is cut and turned from time to time, and returned to drain. When no more whey drips from the mass, it is ground through a curd-mill, salted by guess, and put into the hoops, but no pressure is used the first day. No heat of any kind is used save that of keeping it in a warm place after it is put into the hoop. The second day it has pressure applied, and numerous skewers are used during all the time of pressing, which continues usually seven or eight days. Each day the cheese is taken out, turned, and a dry cloth put on, this putting on of dry cloths being continued so long as they are wet by the cheese, continuing so long as thirty days in some instances. After the pressing is done, the cheese is ironed and soldered, by using a hot flat, so as to fill the cracks caused by the tin fillets used in connection with the hoops.

I asked a cheese-maker what they did when they had sour cheese. She replied, "We don't know anything about sour cheese in our method." By their process they do not know anything about sour cheeses, but I conceive they have them and don't know it, or why do they have some thirty cheeses in press at one time, when making only one a day under the rule of pressing as long as they leak whey?

Influence of Land.—In this country very much is attributed to the influence of land upon the cheese produced. They go as far as to claim that good cheese cannot be produced upon certain farms, while farms lying contiguous to, and even where the fields are interlocked, or over-lapped, ever bear the reputation of producing good cheese. Still, facts prove this a fallacy, in my opinion, for when lands change tenants the character of the cheese is changed. I could illustrate this by facts gained while there. Again, I heard that in certain cases, the same person that made good cheese in one place could not in another, and *vice versa.* For these curious facts I have my theory. I believe that the cheese-makers, and not the land, are at fault, or if not exactly that, the knowledge as to what is really required to produce a good cheese by their process, is the true cause. Some places have better conveniences than others, and produce better cheese as a result. I believe this a truer theory than the wholesale defamation of one set of lots and praise of another, where there is not a shade of difference in conformation, soil or culture, for all lands are cultivated by the lease rotation.

Cheddar System.—I found Cheddar cheese was being made in Cheshire, and saw it made there, near Chester, by Mr. Carter and Mr. Lee. At Gorsty Hill I visited Mr. McAdam, a man who has done very much to introduce the system as a practical maker, teacher and writer. I visited Mr. Joseph Harding, of Marksbury, Somerset, the great exponent of Cheddar cheese-making in England. These gentlemen I found to be intelligent, high-minded students and thinkers upon the art. Mr. McAdam claims that good cheese is the result of skill in its manufacture; and Mr. Harding affirms good cheese can be made wherever clean milk can be procured.

The origin of the Cheddar cheese does not lie so far in the past as to have passed from the minds of men. About a hundred years ago, in a little village called Cheddar, in the South of England, cheese manufacture became a subject of interest and study, and from that study resulted a new system, size and shape, with a corresponding excellence. The cheese became famous, and of course a higher price was obtained. From that time for a series of years, the first to adopt the new method carried on a full system of experiments, with a view of improvement and mutual benefit. These experiments have been kept up, and now the cheese stands far in advance of all competition in the markets.

The Cheshire people, who had before stood in advance, thinking its superiority lay in its style of pressing, adopted so much of it, hence their similarity in that respect, but they clung to the old method of making. The Cheddar system is the only one that I have yet examined that deserves the name. I think it more nearly a system because the different effects are more thoroughly dependent upon the causes that are known and kept in view. While there is a complete system of recording the different stages and appearances of each cheese kept from day to day for the purpose of future reference.

I will close my present remarks upon Cheddar cheese, by quoting from Mr. McAdam's pamphlet: "Although the system which we have attempted to explain in this essay, is by far the easiest and most scientific of any practiced in Britain, no one need attempt to introduce it until he has received practical instruction from some one competent to give it."

American Cheese in England.—I will now call your attention to American cheese in England. In Liverpool, I examined many specimens of American cheese, as I did in Chester, Bristol, Bath and London, and of a truth, I saw hardly a cheese that a Yankee would be willing to eat. That, to my mind, was sufficient reason for the difference in price.

Its Defects.—I will turn to the defects as I saw them. Nearly all the cheese I saw was bad in flavor, or, if not, lacking in richness. Nine-tenths of all the American cheese I saw, was porous, or, when not porous, dry, hard and insoluble. Sometimes it was soft, salvy and watery, with bad flavor. But the two great leading defects of American cheese are lack of flavor and porousness.

Bad Flavor.—Bad flavor, as a leading characteristic of American cheese, must occupy some time and close attention. If you ask if this bad flavor consists in being strong or bitter, I would reply, not necessarily either, but sometimes both; and yet, this does not describe the defect. In fact the word "nasty," as we understand that term, is the nearest word that I know. The Englishman does not object to a strong cheese so much, but when the strong is united with a sweetish bitter and acrid or biting taste and an offensive effluvia, he complains, and justly, too, of the flavor. So much does American cheese lack in this respect, that in many cases, when otherwise the cheese would be pronounced good, it cannot be counted equal to third-rate domestic cheese.

Porousness.—Next, I call your attention to porousness, which is to English cheese-consumers, a great defect. Having been accustomed to see cheese that cut clear, smooth, without the least appearance of holes, the presence of them causes a distrust as to every other quality. Indeed, this defect is so apparent that no sophistry of the dealer can convince the purchaser that the cheese is what it should be.

Quality.—Again, our cheese lacks in quality or richness. This defect is not so apparent, but quite as pernicious. I think the poor cheese less apt to be of the worst flavor, but do not suppose that skimmed cheese is better than that containing all the cream. I noticed some cheese that was hard, dry and brittle. This is better in smell and a little better in flavor, but the lack of quality was such as to cause an English dealer to ask, "Can you tell me how such poor cheese can be made, and have all the cream in the milk?"

Soft or Salvy.—Again, there is the defect of soft salviness, which leaves the cheese without character, and often in bad flavor, as well as porous. I mean by this the salviness of butter which has been overworked.

Watery.—Much of the cheese that I saw there was porous, and in the bottom of such cavities there was a watery appearance or wheyey matter, but which I conceive to be decomposed cheese. These were bad in every respect save richness, and that was often deficient. The color of American cheese is defective, but as I spoke of that under the head of the requirements of the trade, it is hardly worth while to repeat it here.

Decay of our Cheese.—Our cheeses are, many of them good, no doubt, when they are on the shelves here, and even in New York, that are very far from being good there. In fact, many of the defects that I speak of are not at first perceptible, but become so full too soon, or, in other words, they decay too soon.

Sour Cheese.—Sour cheese is a defect almost unavoidable sometimes in our factories, and much to be deprecated. But of the poor cheeses that I saw in England, nine were poor from being too sweet to one from being too sour.

Appearance.—You may now, Mr. President and gentlemen, ask, "What does the cheese appear like when there?" If you were to take a piece of sponge, give it the color of a brick, the consistency of bar soap, and the taste and smell of the original grease, with an addition of the tincture of assafœtida and the bite of peppersauce, you would have a fair representation of much of the cheese I saw there. You ask if we have any good cheese in our country. I would say we undoubtedly do have good cheese here, but from its inherent defects it is not good there. In fact the reputation a cheese may bear here is no criterion of its qualities there, and *vice versa.* Much cheese that stands high here, proves poor there. So far does this go, that certain lots that were shipped here as first quality, would not to my certain knowledge be received as such, but only as second or third quality. One dealer told me that when a shipment was recommended as prime or high quality cheese, it rarely proved so while cheese that they said nothing about proved much better.

And this is the reason why so much cheese is bought on reputation and in defiance of the quality of the cheese in itself, one year's cheese helping or hindering the sale for the first half of the next season.

Nor would an Englishman, coming to this country, be likely to go and pick up the cheese that would prove best there, for the defects of which they complain, and which are real rather than imaginary, come from causes they know nothing about, and the good cheese to his judgment might prove anything except what he expected. You ask, do these changes take place in the cheese after it gets out of our hands? They do. You ask if the transportation across the salt water has any effect? I think not, to any great extent. Its effects would be alike on all cheese, while the defects of which they complain are varied by many differences. These defects are varied with the details and variations in our system of manufacture, and are widespread, showing the system imperfect.

The leading mistakes of our cheese-makers and our system can all be reduced to one word, "hurry." That, in one form or other, is the leading fault of system and manufacturer. We are proverbially a fast people, and we hurry our work, our business, our everything. We make our cheese quick, it cures quick, we get our money quick, and our cheese decays quick, and consequently we get less money for it. Cheese, as a product of manufacture, must depend for its perfection upon the process of its manufacture. If that be wrong, no care or attention can remedy its defects after it has passed beyond the cheese-maker's manipulations. In fact, the cheese made in our country has been made too much to sell. We are in so great a hurry for quick returns that we overlook the true interests of all concerned, and yet the character of American cheese has improved very much within five or six years. What it was before that time, the specimens of dairy cheese shown me give evidence. I now speak of the mass of those sent from our factories. We all know that the process of cheese-making has become longer as years have passed by, till the process of our factories is from a third to a half longer than formerly, and our improvements have been corresponding thereto, proving that hurry is the greatest cause of poor cheese. Still we have room for improvement. We must secure a firm, close, rich, good-flavored cheese, and one that will improve with age, before we can go before the English public and demand a high price. When we can do that, I am of opinion that we may rival them in their own market.

Causes of Defects in American Cheese.—I shall now give my opinions for some of the defects of our cheese.

Bad Flavor.—I think this the direct and legitimate result of hurry. We set our milk so that coagulation takes place in too short a time. This gives an impetus to all the after processes, and the cheese is made all the quicker, not only in the making, but in the curing and in the decay. Again, we salt so lightly that it may cure soon, and it does, very much to the detriment of its flavor. These are the two great causes for lack of flavor, but there are others outside and beyond the control of the maker, such as uncleanliness in milking, as well as that of decomposition of portions of the cheese itself.

Porousness.—Porousness, as I saw it in the cheese abroad, is of three distinct species, arising from three distinct causes. One was a fine pin-hole appearance, the result of using too strong rennet, in my opinion, but am not so certain, as it is a point that needs investigation. The next, by far the most prevalent, was the open, spongy appearance known to you all. This arises, in my opinion, from two causes: First, that of having the milk too new when the process of manufacture commences, and the other from having it put too soon to press, so that fermentation or curing goes on too rapidly.

The third, the worst of all, is a defect arising from a radical defect in our process, which can hardly be overcome. It arises from uneven salting, or from lumps of curd which never get properly salted, and you, practical cheese-makers, know that that sometime occurs from unavoidable necessity. This defect is known by the watery appearance in the bottom of the cavities, and from the offensive odor emitted when under the trier. It is, in fact, decomposition of cheese, and decomposition in cheese is just what decomposition is in anything else subject to decay. Soft cheese arises from two sources; one, the newness of the milk, and the other insufficient scalding, Hard, dry, poor cheese, made from sweet, good, rich milk, is from too high and too rapid scalding, while bitter cheese comes from waiting for too sweet milk to get the proper acidity. I will now close my remarks upon the defects of American cheese, and turn to a point of importance to the American cheese-producer—the improvement of the cheese produced.

How is Improvement to be Made?—Shall we stick to the old system, improve and better it by experiment and research, overcome its defects by persistent and untiring endeavors, or shall we adopt a method already open to us, and proved by long experience to be the best now in use? The Cheddar system stands preëminent as a good cheese-producing system. Would it not be better to take that instead of clinging to the old, with its defects, when they are such as to preclude its ultimate superiority? While in London, I asked the dealers, forming my question so as to give no clue for an answer to suit myself, "What cheese sells best in your market as a rule, and not as an exceptional cheese?" and I was invariably told, "Cheddar cheese."

You may wish to know what the difference of price was between it and American cheese. The very highest price that I heard for American cheese was 62 shillings for 112 lbs., while the ordinary price was from 55 to 58 shillings for 112 lbs. While the price of English cheese was from 73 to 78 shillings for 112 lbs., and the best grades as high as 80 shillings. I have with me a small Cheddar cheese which was worth a shilling a pound, or nearly twice as much as our very best American on the shelf of the maker. I have brought the cheese here to show and to divide, and shall do so for the benefit of the Association.

From these figures you perceive that the difference in price between the very best of our cheese and the ordinary English cheese, is above five cents per pound. And this may be secured immediately by adopting a system that has been perfected by study and systematic experiments, carried on in the true spirit of improvement for over a hundred years past. I am asked—do they get as much cheese from a given amount of milk as we get here? I think as much. I have a leaf torn from a record containing the records of twenty-six days in August and eight days in September. For the twenty-six days in August, the amount of milk used for a pound of cheese was 9.56 lbs.; for the eight days of September, 9.41 lbs. I am convinced that the milk there is not as rich as that here, though I had no means of testing the fact. I draw my conclusions from the facts that the lands are more highly enriched and oftener ploughed and seeded, and the grasses must be coarser and not so sweet.

It may be asked, can we send cheese across the ocean and compete with the English, if it be equally good when made? I think we may. If it is equally good, it will remain good. But allowing that the journey does affect it some, and the gain be only one-half the difference, or even as low as two cents a pound, the gain would be a vast amount of money. The export of cheese up to the first of October, this year, was 34,219,043 lbs., which, at two cents increase, gives the sum of $684,380 86, and for the year not far from one and a fourth millions. A sum which may be secured, I am convinced, so soon as we make a prime cheese. You ask: "Will the expense be any greater?" About the same. You ask: "Would there have to be any changes in apparatus?" Only in presses, and having curd mills. You ask: "Does it take more work?" No more work, but a little more time.

I am convinced that the Americans would prefer the Cheddar cheese for their own use, if once it was introduced here. And I am convinced that the system will be adopted here ultimately, though even the Cheddar cheese is not yet perfect, and, perhaps, may be improved as to some features. Mr. McAdam and Mr. Harding are both lamenting the lack of positive knowledge in reference to the chemical relations of milk and rennet, the influence of time and temperature upon the product. Both are looking to scientific investigation to secure a test for detecting the presence of the proper acidity in milk to tell the time when the operations of the process should be commenced. They claim that we are just commencing in the road of proper investigation and do not claim the system of Cheddar cheese perfect. In fact, the art of cheese-making, though as old as Job's time, is yet in its infancy; no scientific research has yet helped the practical cheese-maker in his labors.

This study, involving the moneyed interests of thousands and an aggregate capital as great as any other in the country, opens a field worthy the study of a life-time, but I fear there are few prepared to offer as a reward for its investigation an inducement equal to the labor it deserves. No person can enter upon the thorough practical investigation of this subject unless he be both chemist and cheese-maker. The fact that a man is the first, will not compensate for his deficiency in the latter, either to the spirit or practicability of his research, hence the dearth of practical suggestions from scientific men. No subject deserves a more thorough and wide-spread range of experiments, based upon practical scientific truth, than the one of cheese-making. Yet nowhere do we find any valuable suggestions from scientific men. True, they analyze cheese, and tell of what it is composed, and when a good one and a poor one are presented, which have been pronounced so by a practical judge, they tell that the one has the good qualities and the other is lacking. Still they do not know and have not undertaken to show the means by which the best was made best, or why the poorer failed of being best.

Factories and Factory Cheese compared with Private Dairy Cheese.—Since my return, I have been met everywhere with the question, "Do they make cheese in factories in England?" They do not, and perhaps never will. For once, we are very far in advance of them if uniformity is required. I hear that there are indications that dairymen are about to withdraw their patronage from the factories. I can assure you, gentlemen, that a greater mistake can hardly be made by cheese-producers, if a foreign or healthy home trade is sought. I noticed private dairy cheese abroad, and I can assure you, that if the dairymen return to the old way of making cheese, they will ultimately come back again, willing for once to acknowledge they have made a mistake. Private dairy cheese, as I saw it, was of the poorest quality in every respect; some defective in some respects, and some in others, as is the factory cheese, but much more so. The factories will ever accommodate three classes of producers—those having small dairies, those having very large dairies, and those that cannot make good cheese, and these three classes constitute nine-tenths of all the dairymen, while not one in five of the remainder would be willing to make their own. But it is claimed that there is no difference in price for one or the other. I ask who are these private dairymen who are getting an equal price with the factories—who but the very best cheese-makers among you, having the right number of cows to have the right sized cheese? And how much do they owe to close observation to the factory system and adopting it?

Average of Both.—The very fact that the factories were instituted could but lead to the result which I noticed before—that of absorbing dairies, and millions of dollars have already been thrown into the coffers of the dairymen of the State; and now if you let them languish and die out for want of support, so sure will you lapse back to the old system and the old inferior article and consequent inferior price. Still, many defects may be found in the factories, which will, I hope, be overcome as rapidly as they are known and ways suggested for their improvement.

The concluding remarks of Mr. Powell relate to the expediency of sending an agent to England to gather facts, opinions, statistics, &c., in regard to cheese-making. At the meeting before alluded to, a National Cheese Manufacturers' Association was formed, and it is stated that X. A. Willard, Esq., has been appointed the agent of this Association, to visit England and report on the cheese dairies of that country.

DISEASES OF CATTLE.

THE CATTLE-PLAGUE, OR RINDERPEST.

During the present year a pestilence has appeared amongst the cattle of England, which has already done great damage, and has given just cause for serious alarm. It is a disease to which veterinarians have given the various names of Contagious Typhoid Plague—Steppe Disease—Typhus Contagious Boum—Cattle Plague—Rinderpest, &c., &c. It belongs normally to the steppes of Russia and the vast plains of Siberia and Tartary. It has occasionally made inroads to the westward, having at several periods destroyed great numbers of the cattle of countries bordering on the eastern shore of the Atlantic, and more than once, before the present year, appearing in England.

The highly contagious character of the disease, its malignity and incurability, require the most thorough precautions in reference to its spread. Separated as we are from the eastern continent by a breadth of three thousand miles of water, it might at first glance be thought unnecessary to trouble ourselves in regard to the use of means for preventing its introduction to this country. But within a few years we have seen a very fatal cattle-disease—the Pleuro-pneumonia—brought to our shores by animals imported from Europe, and there is reason to fear that the cattle-plague is more dangerous in regard to its transmission, than any other disease of which we have any knowledge. On this account the importation of cattle from abroad, or at least from any country where there is the least probability of the prevalence of the plague, should be prohibited. The attention of our Government has already been called to this important matter, and it is to be hoped that proper restrictions will be rigidly enforced.*

But should the disease make its appearance in this country, it is not improbable that it will be in a modified form. The cholera, which may be said to have its permanent seat in India, occasionally spreads over the world; but its ravages are less as it extends westward, and when it reaches this country, are comparatively small, as contrasted with the mortality which it inflicts on oriental countries. Still we should not relax our efforts for the prevention of the cattle plague. Its late appearance in England is traced, beyond a question, to the importation of cattle from Russia by the Baltic sea. They were sold in Islington market, and the disease was thus communicated to the London milk-dairies, among which it made great ravages. Since it broke out in these herds, it has appeared in various localities in the country. It was thought to have broken out in sheep, but whether this was really so or not, no evidence has appeared lately of its appearance amongst these animals. It appears, however, that sheep may be the medium of communicating the disease—that is, sheep which have been in contact with cattle having the plague, may transmit it to cattle not otherwise exposed to it. It seems, too, that the disease may be carried in persons' clothing, like the small-pox. Prof. Simonds, of the London Veterinary College, in his report, made a few years since, after the most thorough examinations and inquiries in those countries of the continent where the disease was then prevailing, states that a carpenter's apprentice employed on an estate where the disease prevailed, escaped the vigilance of the guards which had been stationed round the place, and went to his father's house, which was distant about two thousand paces. "While there he repaired a manger in his father's cow-shed, and also changed the clothes he had on when he came home. The rinderpest, in consequence of this, broke out among his father's cattle. The whole were thereupon killed, and a military cordon drawn around the premises."

---

*Since the above was written, Congress has passed the following:

AN ACT To prevent the spread of Foreign Diseases among the Cattle of the United States.

Be it enacted, &c., That the importation of cattle be, and hereby is, prohibited.

And it shall be the duty of the Secretary of the Treasury to make such regulations as will give this law full and immediate effect, and to send copies of them to the proper officers in this country and to all officers or agents of the United States in foreign countries.

Sec. 2. *And be it further enacted*, That when the President shall give thirty days' notice by proclamation, that no further danger is to be apprehended from the spread of foreign infections or contagious diseases among cattle, this law shall be of no force, and cattle may be imported in the same way as before its passage.

The main conclusions to which Prof. Simonds arrived are the following:

"That all the facts connected with the history of the outbreaks of the rinderpest concur in proving that the malady does not spread from country to country as an ordinary epizoötic, and that if it were a disease exclusively belonging to this class, the sanitary measures which are had recourse to throughout Europe, would be inefficient in preventing its extension, and consequently that in all probability we should long since have been both practically and painfully familiar with it in this country, as hundreds of our cattle would have succumbed to its destructive effects.

"*That it is one of the most infectious maladies of which we have any experience*, and that it is capable of being conveyed from animal to animal by persons and various articles of clothing, which have come in contact with diseased cattle.

"That the ox tribe is alone susceptible to the disease; and that the morbific matter on which it depends lies dormant in the system for a period not less than seven days, and occasionally, according to some continental authorities, *as long as twenty days*, before the symtoms declare themselves.

"That the deaths often amount to 90 per cent.

"That the malady is one in which the blood is early if not primarily affected; and that subsequently the mucous membranes throughout the entire body become the principal seat of the morbid changes.

"That all varieties of medical treatment which have as yet been tried have failed in curing the disease; the recoveries which take place having for the most part depended on the healing power of nature."

Under the apprehensions which are at present justly felt in regard to the cattle-plague or rinderpest, it is important that the people of this country should possess all the information that is attainable in regard to it. The following description of it by Prof. John Gamgee, of the New Veterinary College, Edinburgh, given in his work on the selection, diseases, &c., of Dairy Stock, will be found both interesting and valuable:

This, the most fatal epizoötic observed amongst cattle, is peculiar to the bovine species, and is a very contagious fever attended by inflammatory action of the alimentary canal, and ulceration of the intestines.

The contagious typhoid plague invariably originates in the East, and particularly in Southern Siberia. Its spontaneous origin, regarding which as little is known as with other epizoötic, maladies, is evidently due to conditions of soil or atmosphere, though some have thought that the cattle of the Russian steppes, could alone be primarily affected. Doubtless this is an error, and as the disease spreads in the lines of communication between different countries, particularly in times of war, when cattle are used in the transport service as well as to supply food for the soldiers, no breed of cattle is spared, and all succumb in the most rapid and fearful manner.

Regarding the history of the disease, we have precise accounts of its disastrous effects at repeated intervals, for the last 1,400 years. It is doubtful if it be the same murrain which affected the cattle of Egypt in the days of Moses. Youatt, is his work on cattle, speaks of the pestilence as it raged amongst the cattle of the Greeks during the seige of Troy; the plague referred to in Homer's Illiad is evidently the bubonic pest, and not the contagious typhus, as it spared not mules, dogs, nor men. Virgil, too, in his *Georgics*, does not refer, as is believed by Youatt, to the true cattle murrain, but to the epizoötic form of malignant anthrax, affecting horse, ox, dog, or pig.

Whatever the plague of old might have been is comparatively unimportant and beyond the object of this memoir. The plague, respecting which we have authentic records, spread westward from the banks of the Don and the Volga towards the Danube, at the period of the migration of the people, when the Goths descended towards Constantinople, and were so repeatedly repulsed by Theodosius. It stretched over the whole theatre of the war in the course of time, decimating the cattle of Illiria, Northern Italy, France, and Belgium. When Charlemagne attacked the Danes he was followed back into his country by the murrain, which created immense havoc amongst the herds of France. A few years afterwards, in 817, the cattle of Hungary were again destroyed by the disease which found its way across the Drave and extended to the west. Though it is probable that rarely as long as fifty years elapsed without a visitation of the murrain over part or most of the European Continent, still authentic accounts of general attacks of pestilence amongst cattle are not to be obtained from between 817 and 1223, when it again passed from Hungary into the western countries. With the exception of another period of mortality amongst cattle about twenty years later, we step to 1625; of the intervening period there are but indefinite records. In 1625 the plague entered the North of Italy; it extended along the banks of the Po, and was the cause of discord between the inhabitants of Padua and Venice; Dalmatian cattle-merchants introduced it into the first of these two cities, and thence it spread through the Venetian territory. The mortality amongst cattle all over Europe, from the year 1710 to 1717, has perhaps never been equaled. In 1709 the plague passed from Tartary through Muscovy into Poland, Bessarabia, Kroatia, and Dalmatia, into Upper Italy and France—from Hungary into the south of Germany and Switzerland, and from Poland it spread north and south into Silesia, toward the shores of the Baltic. Ramazzini wrote his "Dissertatio de Contagiosa Epidemica" at this time, in which he laid great stress on the eruption which occurred in the mouth of the animal on the sixth and seventh days; this eruption was only a symptomatic aptha, but from it Ramazzini styled the malady the "cow-pox plague." The pestilence found its way through the Papal States into the kingdom of Naples, where, in a short time, the mortality more than doubled that which occurred in the north; 70,000 head of cattle perished. Many thousands during this time died in Silesia; the malady found its way into the Netherlands, with the effect of destroying 200,000 head of cattle in Holland alone. It was especially fatal in Denmark, Holstein, and Finland. It crossed the channel into England in 1713, and was as destructive as elsewhere. Lancisi's injunctions respecting the immediate slaughtering of affected animals were fully carried into execution, and upward of 6,000 animals were killed in the counties of Essex, Surrey, and Middlesex alone. The plague, it appears, was thus stayed in a few months.

Very stringent measures were adopted in Germany, as they had been in England, but the destruction of cattle was so fearful, that according to Paulet, only in the three years of this attack, 1,500,000 head of cattle perished in Europe. Schroek, Rammazzini, Kanold, Lancisi, Genf, and many other physicians, wrote upon it. Kanold says that from 1713 to 1730 it appeared here and there, but not as a general scourge over Europe. Indications of it were manifested in 1723, 1724, 1728 and 1729. It found its way again across Wallachia, Podolia, Volhynia, Hungary, Austria, Prussia, Saxony, crossing the Palatinate, and following the war, it entered Piedmont in 1839. In 1840, Hungary and Bohemia again suffered, and the pestilence extended over the whole of Germany, through the west into Switzerland, Piedmont, Franche Comte, and Dauphine—northward from Poland, to Courland, Livonia, Denmark, Sweden, Holland and England. Youatt speaks of it: "In 1745 it laid Holland waste a second time. More than 200,000 cattle now perished. In the same year it again found its way to the coast of Britain. It seems to have been clearly brought to us from Holland, although there are two versions of the story. Dr. Mortimer says that it was imported by means of two white calves which a farmer at Poplar sent for, in order to cross his own breed; and that it spread into Berkshire by means of two cows that were brought out of Essex. The other account is, that one of our tanners bought a parcel of distempered hides in Zeeland, which were forbidden to be sold there, and should have been buried, and thus he transplanted this dreadful disease here. 'Thus, by one man's unlawful gain,' says Mr. Layard, 'if by this way it was conveyed, the ruin of many graziers and farmers was effected.' It is is certain, however, that the pest first appeared in the immediate neighborhood of London, and on the Essex side of the river, and that thence it gradually spread through Essex and Hertfordshire, and the whole kingdom.

"For more than twelve years it continued to lay waste the country. The number of beasts that were actually destroyed by it was not, and perhaps could not be, ascertained, but in the third year of the plague, when the government had so seriously taken up the matter as to order that every beast that exhibted the slightest mark of infection should be destroyed, a remuneration being made to the owner, no fewer than 80,000 cattle were slaughtered, besides those which died of the disease, and which formed, according to the narration of one of the Commissioners, nearly double that number. In the fourth year of the plague they were destroyed at the rate of 7,000 per month, until from the numerous impositions that were practiced, this portion of the preventative regulations was suspended.

"In the year 1747, more than 40,000 cattle died in Nottinghamshire and Leicestershire, and in Cheshire 30,000 died in about half a year."

The plague wore itself out in the course of ten years in some parts, but it lasted for more than thirty in others, and in spite of the wisest councils proffered by the learned of all Europe, 3,000,000 head of cattle were cleared off. Twenty more years passed over, and cattle-breeders prospered; they accumulated stock to feed the pestilence of 1770. The disease which Youatt refers to as appearing in France in 1757 is not the contagious typhus; it spread from west to east, and was not limited to the ox. In 1770 and 1771 the true cattle-plague again entered Holland, and the ravages it committed are described as terrible in the extreme. In 1769 and 1770 it carried off 98,000 animals in one province of Frisia, and in the south of Holland, during one year, 115,665 head of cattle met with the same fate. During the same period, and in the north of Holland the disease attacked 225,831, of which 102,276 perished, so that the total loss in Holland alone during one year, amounted to 375,441. From Holland the disease penetrated Austria and French Flanders, reaching Laon, and only the provinces of Artois and Picardy, where 11,000 animals also died. Paulet says scarcely had Flanders and Picardy repaired the loss of their cattle, when in 1773 the murrain manifested itself in Hainault, and with renewed vigor in Holland. The epizoötic destroyed the cattle of Flanders, Picardy, Soissons and Champagne, but the loss, says Delfaond, was not estimated at this period.

From the year 1770 the northern provinces of France, stocked with cattle as as the present day, were spared the bovine pest, when in the month of August, 1774, this malady, which was devastating Holland and Picardy, broke forth on the borders of the ocean at Bayonne and its environs, and almost exterminated the cattle of many French provinces. The number of cattle that succumbed was 150,000, and these worth 15,000,000 francs.

The contagious typhus followed Napoleon into Italy, in 1793, 1794 and 1795, and Buniva tells us that in three years Piedmont lost from three to four million head of cattle. In 1796 it broke out amongst cattle of the French army's escort on the borders of the Rhine, and as it was not looked upon as contagious, it spread with fearful rapidity to all the horned beasts of the Lower Rhine provinces. It entered Switzerland and returned into France by Burgundy, reaching near to the gates of Paris. Only in the circle of the Lower Rhine the mortality amounted to 11,047, and in the twenty-seven departments of France, to which it spread, 130,000 animals died, and their worth in money amounted to 12,000,000 of francs.

Faust calculated that from 1713 to 1796, 10,000,000 head of cattle perished in France and the above mentioned parts of Belgium.

During the ever memorable period in history, from 1792 to 1815, when war and rebellion, invasions and usurpations, were accompanied by misery and famine, pestilence was one amongst the calamities befalling man, and the cattle plague—constant associate of wars in which the Russians or their nearest neighbors took part—broke out. It spread through the Danubian Principalities to the south of Germany in 1795–6, and continued its destructions here and there in an uninterrupted manner up to the year 1801. Walz wrote on it as it occurred in Wurtemburg; Will observed it in Bavaria; Keith and Schaller in the vicinity of Erlangia. From the Grand Duchy of Baden it entered Switzerland. The ravages it created, and the misery it induced in various regions of Austria, Bohemina, Saxony, Prussia, Poland, Hungary, Siberia and France, are beyond description. A few years of respite were at hand, and while the operations of war were in a great measure confined to the west, the cattle-plague returned to the Russian steppes. But in 1806, when the Cossacks of the Don mustered on the Vistula, in obedience to an urgent appeal of Alexander, the cattle-plague spread from the desert lands into the agricultural districts of Lithuania, Prussia, Siberia and Kurland. Napoleon's retreat after the battle of Eylau, favored the extension of the contagious typhus, and it exterminated the cattle of the above and adjoining provinces for two whole years. When the French army advanced to Moscow, and penetrated the heart of Russia to meet with defeat and famine, all conditions favored an extension of pestilence. Though so few returned to France to recount the hardships they had undergone, this epoch was marked by another extension of the disease of the steppes. In 1813–14, when the allied forces under Schwartzenburg invaded France, the Rhine provinces, Switzerland and France suffered immensely from losses occasioned by the contagious typhus. The most stringent sanitary measures, slaughtering the diseased and isolating the healthy, soon put a stop to it, and no more was heard of it in the western half of Europe until 1827.

The wars in Europe and Asiatic Turkey were carried on with such rigor and valor, that the call on the people in Western Russia and the Danubian Principalities for labor and provisions, exhausted all internal resources, and led to disease in man and beast. The repeated invasions of Turkey were the cause of very extensive requisitions in the Principalities; but the Russians had passed the Pruth; Geizmar reached Aluta, and his Cossacks had penetrated Little Wallachia without opposition, and in consequence the Sultan obtained only 500 head of cattle and 1,000 sheep from Wallachia, whereas Moldavia yielded nothing. "The Russian declaration of war, however, was accompanied by a demand for 250,000 loads of corn, 300,000 tons of hay, 30,000 barrels of brandy, and 123,000 oxen, in addition to the forced labor of 16,000 peasants, who were to be employed in making hay on the banks of the Danube. The loss occasioned by the payment of these requisitions in bills instead of cash, was not the only disadvantage to which the unfortunate people were immediately exposed; for as the local supplies were soon exhausted by such an army it became necessary to transport provisions from Bessarabia, by means of forced labor. The peasants, also, soon exhausted their own supplies, and were reduced to such extreme want in consequence, that they died in great numbers in the wood, as did also their cattle, in consequence of a murrain. The serious extent of the disease covered the roads with carcasses, which, by their putrefaction, coupled with the want of cleanliness in the Russian soldiers, gave rise to typhus fever in its very worst form—that of the plague. This fearful scourge first appeared at Bucharest, and it continued to afflict the Russian army, as well as the inhabitants, during the whole of this and the succeeding campaign."*

---

*COL. CHESNEY.—The Russo-Turkish Campaigns. London, 1854.

Bessarabia, Moldavia, and Wallachia, were not the only provinces over which the cattle-plague extended, producing such terrible disasters; but it soon found its way into Podolia, Volhynia, and thence to Prussia, Saxony, Hungary and Austria. The losses continued great for some time, notwithstanding all efforts to check the disease, and in 1830 it appeared in various parts of the Austrian territory, especially in Illyria. At this period excellent memoirs were published on contagious typhus, especially by Lorinser and Jessen. Annually, indications of the plague continued to be manifested here and there in the steppes and adjoining countries, so long as the indigenous cattle only were affected; as soon, however, as the herds of Austrian cattle belonging to the German colonists, were attacked, few survived, not even ten per cent., and the losses were severely felt. At all times the German colonists suffer from this scourge, their cattle being infected by the herds which are driven laden with salt from the Crimea, and the remaining portion of the steppes of saline base between the Caspian and the Baltic, and which are supposed to have once formed the bottom of the waters when the seas just mentioned were united. The German colonists which thus suffer are in Moloshna and in the vicinity of Maripol. It is said that the neat cottages and well-built barns and out-houses, surrounded by trees and gardens, and by highly cultivated fields, bear signs of wealth and comfort, and of the care bestowed on them by an industrious population. The German colonists form a striking contrast to the dreary country in which they are situated, and to the miserable Russian villages, and the still more wretched Tartar aouls around them. Their situation is always well chosen, on some sloping ground, on the border of one of the few rivulets that water the country.

My object in dilating on the features of the German colonies, has been to point out the interesting fact that, although surrounded by steppe land, the colonies, their people, and their cattle, exist under very different conditions to those pervading the countries, the herds, and the habitations of the Cossacks, the Tartars, and the Calmucks, and although, as I shall hereafter show, the cattle of the steppes, accustomed to hard living, withstand the steppe murrain, it is perhaps no special breed that presents this impunity, but cattle in general reared in the most inauspicious manner, and brought by habit to counteract injurious influences of a peculiar nature.

The next account of a special attack of contagious typhus is to be found in the twelfth volume of the *Bulletin of the Academy of Sciences of Paris.* It is spoken of under the head of typhus; and, as Hering and others have shown, the outbreak was one of the ordinary pestilential fevers affecting cattle. Towards the end of the year 1841, a ship going from Caramania—Asia Minor—to Alexandria, lost one out of 200 oxen which constituted its cargo. On the arrival of the ship at Alexandria, the whole of the surviving animals were affected. In order that they might be treated with better effect, they were landed and driven to a village close at hand, with orders that they should be kept in strict quarantine. This injunction was not attended to, and in 1842 the plague had extended to the Egyptian cattle, and the proprietors, in order to get rid of the affected beasts, drove them to the important market of Tantah, a village on the Delta. In a short time the plague extended over the whole of Egypt; but in the spring of 1843 it disappeared, most of the animals having fallen its victims. Towards the close of the same year, large numbers of cattle passed from Nubia into Egypt, especially Ghizeh, where the pestilence had first committed the greatest havoc. The disease, which had perhaps been completely extinguished in the spring broke out again, and destroyed every animal, notwithstanding many precautions were taken. Ninety per cent. of the cattle of Egypt, at one time or another, caught the contagious fever, and the losses in 1842 amounted to 300,000 head; on the the second invasion in 1843, 35,000; and in its third, 15,000—that is to say, in the three years 350,000 head of cattle fell a prey to the malady.

Dr. Pruner, in his work on the Diseases of the East, describes the same attack of the cattle-plague in Egypt which

Humont has spoken of in Paris. According to him, it broke out amongst oxen which were taken from Adana and Stursus, in Syria, into Egypt, and its chief cause is believed by Pruner to have been improper food, especially deteriorated and unwholesome beans, which were given to the cattle; and at the same time the animals were cooped and crowded together to an unjustifiable extent. Hering believed it most probable that the real cause was the contact of these animals with others affected by contagious typhus, the improper food and deficient ventilation simply favoring the development of the disease.

In the autumn of 1844, the cattle-plague threatened many of the countries adjoining Russia. From official reports, we find that it spread to Bohemia in the month of September, and penetrated Konigsgratz and the circle of Bidschow, where extensive trading in cattle is carried on. The veterinary surgeons in Bohemia recognized the disease, and their observations led them to look on it as the true fever of the steppes. Medical authorities at Prague argued that the pestilence had arisen spontaneously in Bohemia from a combination of causes, analagous to those which had given rise to typhoid diseases in man, and similar epizoötics; this opinion, accepted by Government—it being supported by Madherny and others—was the cause of much laxity in the adoption of sanitary measures, and in the meantime the plague extended rapidly throughout the whole of Bohemia, and the sixteen districts of this kingdom were completely invaded; the whole of the countries of Western Europe were alarmed at its fearful advances. Dr. Eckel, director of the Vienna Veterinary School, repaired to Bohemia to make investigations into the real nature of the then existing malady. He found that it was truly the "rinderpest," which never could have arisen from unfavorable states of the weather, or combination of other prejudicial influences of local origin, such as deteriorated food, development of the miasmata, etc., but that it absolutely depended on the extension of disease from the steppes which would alone account for the enormous mortality amongst the cattle. Galicia at this time suffered in consequence of the importation or simple transit through of oxen from Podolia and the adjoining Prussian provinces, and from all appearance it may be admitted as certain that the malady at first originated in Bessarabia. During the first half of September, it spread from Galicia into Moravia, and one after the other, it attacked twenty-four districts, throughout which 1,065 animals caught the distemper, and out of the whole only 163 recoveries were reported; of those that died, 129 were slaughtered. Instances of the disease were observed only in a few districts of Hungary, but the symptoms presented by the cattle were indubitably those of the typhus.

In the south of Austria some cases were witnessed as early as during the first half of October, 1844; from this time to the 15th of December of the same year, the whole of the deaths were confined to three districts, and in all probability this depended on the fact that as soon as the disease was recognized to be the veritable cattle-plague by the delegates of the Vienna College, all appropriate measures to stop its progress were speedily projected and carried into execution. According to Eckel's investigations during his stay in Moravia, 5,224 head of cattle from Podolia were bought at the cattle-market of Ollmür by thirty-two cattle-merchants, and they consisted of 119 lots, which were driven into Bohemia; of these 5,008 traveled on the high road to Prague, and the others were driven in various other directions. The outbreak of the disease in Bohemia occured in different parts corresponding to the directions in which it was afterwards found the cattle had deen driven. In conformity with the opinions of Eckel, orders were issued in Prague on the 6th of December, that certain sanitary measures should be stringently carried into execution. From this time the plague speedily diminished in virulence and extent, so that towards the end of January, 1845, it was looked upon as having completely disappeared from the Austrian empire.

On the 19th of January a statistical report was draw up, indicating the losses sustained in Bohemia in consequence of the cattle-plague, and the result was, that on the whole, 2,197 animals had been infected, of which 115 had recovered, 1,122 died, and 45 had been destroyed, and six were still on the sick list.

From 1849 to 1851, various parts of Austria suffered from invasions of the contagious typhus, and the professors of the Veterinary College of Vienna were called upon to keep up a correspondence with persons qualified to institute inquiries, and collect information wherever it had been reported the pestilence raged. As the disease advanced, and local authorities were opposed to enforcing rigid sanitary measures, Eckel and Röll proceeded in different directions, with the object of making such arrangements as would best tend to check the ravages occasioned by the "rinderpest," and in this manner Dr. Eckel accumulated abundant materials for an extensive and remarkably accurate report on the history of the plague during the above mentioned period. This report is published in the *Quarterly Journal of Veterinary Science*, of Vienna, for 1851, and it is so very suggestive that I do not hesitate to draw largely from it for the benefit of my readers.

On the 3d of January, 1849, the Galician Government was informed by Dr. Goldschmidt, of Body, (a frontier town of Austrian Galicia, which has trade with Russia, Poland and Turkey), that he had heard from two travelers that in the summer of 1848, the cattle-plague had spread extensively over Russia, and that during the winter months it had passed into Podolia, Volhynia and Poland, having therefore reached the Galician frontier. Custom-house officers and other authorities on the confines were made to report on the real facts of the case, but they were so ignorant of them, that it was proposed even to abolish the ten days' quarantine already imposed on cattle imported from Russia. The Russian authorities in Volhynia, however, confirmed the statements of Goldschmidt, and it was ascertained that fifteen villages of the last named province were devasted by the murrain. The quarantine for cattle brought from various infected districts was increased to fifteen days.

It was reported by the Galician Government on the 5th of April that the plague had appeared in the district of Zloczow, bordering on Volhynia, and that on the 20th of February it had shown itself in the little town of Radzichow. A veterinarian, Josephu, was sent to investigate the matter, and he stated that in the month of January the murrain had shown itself at Barytow, Wygoda, and Podmanasterek, all on the frontier. It was said that it was not the true cattle-plague which had broken out at Barytow, and respecting the two last mentioned places no particular statements had been made. Josephu suggested that cattle should not be imported, that the fact of the outbreak of the murrain should be made generally known, that strict inspection of cattle in every part of the country should be instituted twice every week, and further tidings should be collected respecting the state of the plague in Russia.

The Professors in the Vienna Veterinary College had received the above information through the Minister of the Interior, and weekly reports were furnished with great regularity. In the year 1849, four circles and twenty-five communities were infected in Galicia. Information of the spread of the murrain was also obtained from Transylvania, and, from the movements of troops, it had been carried there as early as the beginning of August, and in consequence of the miseries of war it extended over the greater part of the province by the end of December.

On the 4th of March, 1850, the Galician Government announced the outbreak of a typhus dysentery among the cattle in the district of Zolkiew, and further information from consuls and agents disclosed the appearance of the true plague in Wallachia, Bessarabia, Podolia, Volhynia, and Poland. Satisfactory news was received from Moldavia, and the Governor of Transylvania reported that on the 25th of March the pestilence had been completely stayed in several districts. On the 5th of April reports had reached Vienna of new outbreaks in Galicia, but on the 8th of June the malady had almost entirely subsided, only seven animals being at that time affected. Transylvania was also clear, but a district on the Moldavian frontier began to suffer, and the greater part of the province was quickly overrun.

On the 8th of August Dr. Eckel, Director of the Vienna Veterinary School, with another Veterinarian, Dr. Langenbacher, proceeded to Hungary, to the Bannat (that portion of South Hungary between the Maros and the Danube), and the Vayvode where the contagious typhus had made great havoc. Prof. Röll proceeded for the same object to Cracow, as the murrain had extended far into the coutries on the borders of the Vistula, and was therefore approaching the Moravian frontier.

On the 6th of August some cases of "rinderpest" had been observed near Vienna in two herds of cattle coming from Hungary. These herds had, on the road, been brought in contact with cattle having the pestilence, so that at Riegelsbrunn, in Simmering, and in the Vienna cattle-market, nine oxen died, bearing unmistakable symptoms of the "steppe disease." Professors Müller, and Pillwax, and Büchmüller, and Bruhl were all actively coöperating in or near Vienna, or at a distance.

At no time was the contagious typhus so well studied, and its progress so well followed out, as by the number of learned professors whose names have just been mentioned, and the details connected with the origin, progress and extension of the murrain through the Austrain dominions, from the month of January, 1849, to March, 1851, have been recorded with the greatest exactitude. I repeat what I have said before, that actual historical notices are the most difficult to gather, but the most instructive to peruse, when referring to such a disease as the cattle-plague, which may be prevented, but may almost be laid down as incurable.

In 1849, Austria was invaded by the plague for the eighth time during the present century, and the malady broke out at two distinct points of the eastern frontier of the empire. It spread in one direction from the north-west, and this may be called the Volhynio-Galician line, and from the south-west, or in the Wallachio-Transylvanian line. The first line of communication extended to lower Austria, the countries on the Danube and the Leytha—and the second, or Wallachio-Transylvanian, crossed the level country of Temesvar, the town of Baja, Zombor, Stutweissenburger, and into the district of Oedenburg, where it stopped to extend no further.

The Austrian dominions were not quite clear of typhus until after March, 1851. A very interesting pamphlet on the rinderpest in Kamionka Woloska, in Galicia, was published by Dr. Weber. A farmer had bought at the market Olaszkowce (in the circle of Zalsczik, on the Russian frontier), 101 oxen which came from Bessarabia. The whole herd appeared healthy, but *eight days after the purchase*, one animal was taken ill, and the symptoms consisted of loss of appetite, diarrhœa, and discharge from the eyes. It had only been three days amongst the other live stock of the farm, but seven days later, the two animals that had been standing near the diseased one, took the malady, and one of them, a cow, died on the third day from the time she was observed to be unwell. The disease spread through the farm and adjoining portions of the village of Kamionka, so that on the 18th of August, 1851 (one month after one of the cows of the place had become affected) 25 beasts had taken the plague; on the 25th of August, 56 animals; and by the 28th of September, 158 head of cattle had caught the distemper; and of these 93 died and 65 were cured. It is most interesting to remark, that of the imported herd no other animal suffered besides the one above mentioned, and which communicated the disorder to the farm.

The cattle murrain was almost confined to Russia through 1852 and 1853. It was peculiarly fatal during the summer of 1853 in the north of Russia, and it has been described in a Russian medical journal, as it was observed on one estate during intensely hot weather, when sheep died of the Siberian bubonic pest, and men of fever; great mortality also prevailed amongst swine and birds. The disease in its very dangerous form lasted only eight weeks on the estate alluded to.

From the month of October, 1853, to April, 1854, we can trace the steppe disease into Galicia, through Moravia, Bukowina, Silesia, Bohemia, Lower Austria and Hungary. The first signs of a pretty general outbreak in cattle were observed on the 4th of October, in the circle of Przemysl, at the village of Bucow. Some fat cattle from Poland were stationed at Bucow for the purpose of being fed and rested, and they carried the disease with them. The neat stock of a farm at Starrawa was grazing on some pasture land at Bucow, and it took the disease. Hides were bought at the last-mentioned place and taken to Lackawola, thus transporting the contagious element, and communicating the disease, either directly or indirectly, to the animals of fourteen villages.

During the eastern campaign considerable alarm was excited in the Crimea, and the attention of the French and British Governments was directed to the possibility of all provision of fresh meat being stopped, as the cattle of the steppes were dying of the murrain. The amount of preserved meat sent from Great Britain to the Crimea did away with any fear of aproaching starvation, which might have existed, but I cannot forbear speaking strongly against the abominable practices to defraud government, and which were more to the injury of the poor soldier in the field, and which consisted in pickling the carcasses of every diseased beast. Tons of such vile food were shipped alone from Aberdeen; and all because no person of sufficient authority and with adequate knowledge was there to check the operations, and bring the men to justice, who thought anything would do for the soldiers. Mr. Mayer, veterinary surgeon to the Royal Engineer Field Equipment, says in the *Veterinarian*, that about the end of August, 1855, the murrain "was destroying immense numbers of cattle in Asiatic Turkey. By degrees," says Mr. Mayer, "we heard of its nearer approach; and as it was just at this time that we were purchasing bullocks, and knowing that they had been driven some 600 miles from the interior, we became doubly cautious in our dealings. The French, who were also purchasing about the same time as ourselves, and whose camp was a few miles from ours, first received the contagion. I was very suspicious about a lot which we bought the week following, and which I wished consequently to have rejected; but we were obliged to have them, and in a few weeks the diseases made its appearance in our camp also."

In the early part of 1855, it appears the rinderpest was in Poland, but by the month of September it had completely disappeared from the Grand Duchy of Posen, where it had been very rife. At the commencement of the year the orders against importation, instituted by the Russian Government for the Grand Duke of Posen, were withdrawn. In the city article of the *Times* of the 12th of February, 1857, it was said that "advices from Königsberg give unfavorable accounts, regarding the cattle-disease, which during the past two years has manifested itself in Poland and other parts of Russia, and which now threatens to spread to Germany. For a short time during last autumn, there seemed to be some abatement in the distemper, but it has again become very violent."

For the fourth time since 1844, the cattle-plague entered the Austrian dominions; and on the 14th of April it was announced at Berlin that the disease had spread to the Cracow district, in Galicia, and into Austrian Silesia. In the Hamburgh *Borsen Halle* for the 25th of April, a report dated Berlin the 24th is given, to the effect that the rinderpest was making great ravages towards the Carpathian Mountains, and that troops had been sent there to stop its extension, establishing in fact a military *cordan sanataire*. The disease had not made its appearance in very many places* in Galicia, though only one district had remained free.

---

*The term place, which I have been compelled to use so often in this article on the cattle-plague, is a very unsatisfactory one. The only one which might have been used in its stead was community, but it does not in reality mean the same thing, and is equally vague. A district is divided into several places, and a place is a collection of ten or twenty or eve more farms.

On the 30th of April the *Augsburg Gazette* appeared with a paragraph in its columns purporting that the cattle-plague had almost disappeared from Middle Silesia, but still existed in several places of the upper part of the same province. All preventive measures were stringently enforced.

In the *Hamburg Borsen Halle*, for Friday, the 8th of May, I find that in the district for Tost-Gleiwiz, in Prussian Silesia, the plague was almost extinguished, but it continued in the above-mentioned provinces, and the troops were still in activity, attempting to limit its ravages as much as possible. On the 13th of May the *Borsen Halle* reported news of the 8th of the month from Austrian Silesia. In the district of Teschen the rinderpest was making much damage; indeed clearing out the stables. Less mischief than would otherwise have resulted, was anticipated from the means resorted to as preventives, and especially the slaughtering of animals being carried into execution without restriction. The loss sustained by the province is enormous, when it is considered that cattle are very dear, the markets closed, and the Polish herds prevented from entering on Austrian territory. On the 12th of May it was announced that the disease was at Lemberg, and the *Times'* correspondent wrote from Vienna on the 16th, saying that "the murrain has made its appearance at Olschan, near Olmutz, where there is one of the largest cattle-fairs in Austria. On two farms seven animals fell sick, and five of them died; the other two were knocked on the head, as were three more which had a suspicious look about them."

Since the above period, when the malady was exciting great interest in Great Britain, the cattle-plague has made inroads into Poland, Austria and Russia; but I need not lengthen my historical remarks on the subject, as the true lesson the past outbreaks of the steppe-disease can teach us, may be gleaned from all I have stated in the foregoing pages.

To the stock-owner and veterinarian, the history of the disease furnishes as much information as he is directly interested in. The vigorous measures adopted in the countries bordering on Russia to arrest the plague, effectually prevent its spread; nevertheless, should European wars, which it is hoped may never occur again, prove as general as during the last century, they may lead to another invasion of this most disastrous epizöötic. [It will be recollected that the late introduction of the cattle-plague into Great Britain was through the importation of stock directly from Russia, transported by water.—S. H.]

Symptoms.—A period of incubation, varying from four to fourteen days, during which the poison effectually penetrates the system, passes without observable symptoms. A short husky cough, with considerable dulness and prostration, are first seen. The loins are tender, the back arched, the legs drawn under the body, rumination occasionally continues uninterruptedly, the teeth grinding each other, and the animal yawning, as in the case of most febrile diseases. A fever-shiver then usually indicates transition into the second stage, when the characteristic features of the disease are observed. The secretions are checked, the pulse becomes frequent and full, the breathing labored, and the temperature of the body very changeable. Not unfrequently there is a watery discharge from the eyes and nose, a painful cough, total loss of appetite, and a craving for cold water. The scanty excrement, high-colored urine, stiffness of extremities, and dry, unhealthy-looking skin, all indicate a prostrating and rapidly-advancing fever. The lining membrane of the mouth becomes the seat of a vesicular eruption, and erosions are left behind which occasionally bleed. These are observed on the nose, and even in the clefts of the feet; the last stage is usually attained when the erosions are spreading, and there is then discharge from the eyes, diarrhœa, and progressive emaciation, with increasing stupor, and indeed all the symptoms of speedy dissolution. Death occurs in from three to twelve days. It is most rapid in pregnant animals, which abort, and in young animals exhausted by fatiguing journies.

Ramazzini has described a particular skin eruption which he has termed symptomatic cow-pox, and observed by him during the spread of the cattle-plague in Italy. Frequently some organs are more particularly affected. The intestines chiefly, as proved by the erosions so constantly discovered on post mortem examinations; but the lungs may be inflamed, or the joints and other structures of the body become the seat of exudations and swellings, as in the common cases of anthrax, or black-quarter. Jessen has spoken of the disease as occasionally associated with the lung-disease, or contagious pleuro-pneumonia, and Dr. Headlam Greenhow, in his report on murrain, says: "Steppe murrain probably existed in this country about the middle of last century, side by side with pulmonary murrain; for whilst some of the descriptions of the disease then prevalent, very exactly accord with the symptoms of pulmonary murrain, as that disease presents itself now, other accounts agree more nearly with the description of steppe murrain, given by continental writers of the present day."

The post-mortem appearances of contagious typhoid, are not unlike those of typhoid or enteric fever in man. In addition to the general evidence of emaciation, all the tissues being found wasted, there is a tendency to gaseous accumulations in the areolar tissue all over the body, and a fœtid gas escapes on opening the belly, and especially when the intestines are punctured. There are spots of extravasated blood, or ecchymoses, on the whole of the alimentary canal, and urinary organs. In the third stomach the food is hard and dry, closely packed between the folds of this organ; in consequence of this, a very common apppearance after death from any disease in the ox, it was declared by persons in Scotland, on the occasion of Prof. Simonds going to Prussia to study the disease, that it might be seen any day at home; that it was not contagious, not a plague, and, indeed, simply impaction of the third stomach, probably due to animals not getting enough salt with their food. We should not have noticed these extraordinary views, but for the acceptance with which they were received in the Highland Society, from lectures delivered by Mr. Dick.

We observe that as the fourth stomach and small intestines become the seat of inflammations there is an exudation of yellow or plastic lymph, beneath the mucous membrane of the intestine, particularly in the seat of the solitary and agminated glands, which afterwards become the seat of ulceration. These constitute the characteristic lesions of the disorder.

Treatment.—Little can be done in the way of treatment beyond purging the animals, and exhibiting salines, and acid or refrigerant draughts; employing clysters, and supporting the system by stimulants; tincture of assafœtida and sulphuric ether, a drachm of each, have been injected into the jugular veins, but all treatment appears futile.

As a preventive, inoculation has been tried, but greater reliance is placed on strict supervision, to prevent contagion, or stopping the importation of animals or the produce of animals, from countries where the disease exists.

[Since the above was placed in the hands of the printer, further intelligence in regard to the spread of the rinderpest in Great Britain has been received. The whole number of reported cases to January 20th, 1866, was 107,098, of which 60 per cent. had died, and 10 per cent. recovered. Of the others, some had been killed, and some not finally reported on. Among the various theories which have been started in regard to the nature of the disease, is that which assumes it to be small-pox, and the advocates of this theory have tried vaccination as a preventive. But the latest accounts show that the benefits of this treatment are not established. Professor Gamgee contends that neither vaccination or *inoculation* (which has been extensively practiced in Russia), are attended with results which inspire confidence in them as remedies. The only protection against the malady seems to be complete isolation. It has been kept out of Ireland thus far, by a strict embargo. The Highland and Agricultural Society of Scotland, after a thorough discussion at a late meeting, declared: "That experience has proved the only effectual method of extirpating the cattle-plague, is by slaughtering at once all affected animals and cattle in immediate contact with them."—S. H.]

ON SOME CAUSES OF UNPRODUCTIVENESS IN SOILS.

BY DR. AUGUSTUS VOELCKER,

LATE OF THE ENGLISH ROYAL AGRICULTURAL COLLEGE.

In an uncivilized, thinly populated country, or in a colony where the backwoodman's axe has to clear the ground before anything else can be done, the agricultural settler has little or no opportunity for turning to account the knowledge of agricultural chemistry which he may possess. The case is different in a highly civilized and densely populated country, where opportunities arise for the useful application of chemical principles, physiology, botany and other branches of natural science, just in proportion as agriculture is advancing in conjunction with wealth and population. Therefore we need not wonder that many eminent and practical farmers should be anxious to provide a better general education for their sons than they themselves enjoyed, and to afford them instruction in the rudiments of the particular sciences which bear upon agriculture.

Fully admitting that, even in a highly civilized country, scientific attainments confer far less material benefits upon the cultivator of the soil than acquaintance with the practice of successful farmers, and the possession of good business habits, we may yet assert that the neglect of chemical principles frequently leads to practical mistakes. Such mistakes are often unconsciously committed by excellent farmers, on whose authority good as well as bad practices are handed on from one generation to another.

The causes of barrenness or unproductiveness in soils are numerous: some depending more obviously on the imperfect chemical constitution of the land, may be conveniently termed chemical causes of barrenness; others, like those manifesting themselves in too close or too loose, or otherwise faulty a texture, may be termed physical or mechanical causes of unproductiveness. It is not easy to separate the one class from the other; for in reality the imperfect chemical constitution of land frequently is but the result of bad physical condition. Thus undrained, unmitigated clay soil, does not yield to the growing plant a sufficiency of available potash, phosphoric acid, lime, &c., and may be said to be unproductive as much on account of its lack of available plant-food, as on account of its bad physical condition.

A recognition of the cause of sterility in land often enables the intelligent agriculturist to apply the proper means of restoration. Barrenness and comparative unproductiveness may be due to a variety of causes: sometimes it arises from a deficiency in the soil of something essential to the healthy growth of plants; in another soil it is the presence of something injurious to vegetation; and in a third class it is the impervious character of the land which causes it to be unproductive. Any defect must be discovered before it can be supplied, and the remedy against any injurious substance present in the land is not likely to be found so long as its precise chemical composition is unknown.

It is not a little amusing to find agricultural writers speaking of the bad chemical composition, or the poor physical character of the land as the cause of its unproductiveness. What the chemical condition of the land really is, or what is the precise nature of its poor physical character, for obvious reasons we are not told. No wonder that plain and intelligent men rightly esteem the chemical theories and physical explanations by which attempts are made to enlighten the agricultural mind as to the causes of barrenness of soils.

The present paper only professes to treat of some of the causes of barrenness, which I have myself investigated more particularly. In reviewing the inquiries purposely instituted by me, and the cases with which I became incidentally acquainted, soils appear to be barren, or more or less unproductive,—

1. When they contain something inimical to vegetation.
2. When they are deficient in one or more important constituents which enter into the organization of the living plant.
3. When they contain too large a preponderance of even a valuable ingredient, such as organic matter, sand, lime, and even clay.
4. When there is but a thin layer of soil resting on the bare rock.
5. When the land is thin and rests on an impervious and very thick clay subsoil, or on subsoils containing something injurious to vegetation.
6. When they are badly drained.
7. When they are affected by a bad climate.

Under these seven divisions I propose to treat the subject of the present communication.

1.—*Soils are barren or unproductive when they contain something injurious to vegetation.*

There is a very ready test for ascertaining whether a soil is likely to contain an injurious constituent. All that is necessary is to put a strip of litmus-paper in contact with wet soil; if the blue color of the test-paper turns rapidly red, the soil is certain to contain something that is injurious to plant-life. All good and fertile soils either have no effect upon red or blue litmus-paper, or show a slight alkaline reaction; that is to say, in a wet condition they restore the blue color to reddened litmus-paper.

The acid reaction which some barren or unproductive soils exhibit, I find is caused,—

a. Either by an excess of organic acids (humic acids);

b. Or by the presence of small quantities of the sulphate of iron—green vitriol.

Another substance which occurs in barren soils is bi-sulphide of iron pyrites, a compound of 2 equivalents of sulphur and 1 of iron. It is generally found in soils in which the prevalence of green vitriol is readily detected, and, like the latter, is a most undesirable soil-constituent. The simultaneous occurrence of these two compounds is explained by the fact that green vitriol is the result of the oxydation of iron pyrites in contact with air and moisture, the iron of the iron pyrites becomes converted into protoxide of iron, and the sulphur into sulphuric acid, which, combining together, produce sulphate of iron, or green vitriol. Even as small a proportion as ½ per cent. of green vitriol renders a soil almost barren; and on land containing little more than one per cent., nothing whatever can grow.

In many unproductive soils I have found protoxide of iron in considerable quantities, and scarcely any red peroxides—a sure indication of poor cultivation. This, however, in many instances, may be greatly improved by better drainage, subsoiling, grubbing, and other mechanical operations tending to admit the air more freely into the soil. Protoxide of iron manifests itself by the deep blueish-grey or dark-green color which may be noticed in many clay subsoils, and stiff tenacious soils improperly cultivated. A change of color from blue to reddish brown is justly regarded as a sure sign of improved condition, for it indicates the transformation of protoxide of iron, and tells of the free admission of air into the land.

Protoxide of iron being as insoluble in water as peroxide, can hardly be regarded in itself as a plant-poison; it is rather a test of the absence of atmospheric oxygen from the soil. The readiness with which protoxide of iron unites with more oxygen and produces red oxide, is seen in the rapid change of color which blue clay, dug out of a drain assumes superficially within a few hours on exposure to the air. Protoxide of iron, indeed, is of one the most delicate tests for oxygen, and thus, though it is not injurious to plants in the same sense as green vitriol, which is readily soluble in water, nevertheless its presence implies a complete exclusion from the air, without which vegetation cannot remain in a healthy state for any length of time.

Chloride of sodium, or common salt, generally occurs in an injurious proportion in land recently inundated by the sea. It is true that some grasses and maratime plants grow well enough on such spots; but cereals, roots, and clover, and other forage crops, do not grow well on land constantly kept in a very wet state, and do not ripen unless the heat of the sun during the summer months has had a fair chance of penetrating the surface-soil, and expelling any superabundance of moisture. Soils recently reclaimed from the sea, or land accidentally saturated with sea-water, exhibit in dry weather white efflorescences which consist mainly of common salt, as may be readily ascertained by the test. Although the soil is originally impregnated with but a dilute solution of salt, the evaporation from the surface in dry weather, causes the liquid brought upwards by capillary attraction to become by degrees charged with salt to such a degree that portions crystalize out in the shape of a white saline efflorescence, which is injurious to vegetation. I am acquainted with land which, irrigated purposely with sea-water, under the mistaken idea of improving it, has been thus rendered unproductive for several seasons in succession.

In some soils in India and Hungary, nitrates of potash and soda, two very valuable salts, occur in proportions injurious to vegetation. Like solutions of common salt, nitrates give rise to saline efflorescences, which invariably indicate an unhealthy condition of the land, and frequently destroy vegetation altogether. Common salt, nitrates of soda and potash, it is well known, are used as manuring agents; nevertheless they are injurious when their proportion in a soil is such as to produce white saline efflorescences.

Lest it should be thought that the preceding remarks apply more to imaginary cases than to real ones, I may be permitted to give some illustrations representing instances of barren soils which have been actually brought under my notice.

Soils abounding in organic (humic) acids are very common in all peaty districts. From a large number of analyses of such soils, I will select only one, from Meare, near Bridgewater:

Analysis of Peat Land.

	Dried at 212°
*Organic matter, (abounding in humic acids,)	97.760
Oxides of iron and alumina,	.536
Carbonate of lime,	.855
Magnesia,	.144
Potash,	.131
Soda,	.065
Phosphoric acid,	.053
Sulpuric acid,	.051
Silica,	.403
	100.000

---

*Containing nitrogen, 1.428

In its natural state this soil contained no less than 88 per cent. of water. The percentage of mineral matter, and more especially that of phosphoric acid, is very trifling, and the excess of organic acids is incompatible with healthy vegetation. Lime and marl, as is well known, have the power of neutralizing the humic acids in such peaty soils. They add, moreover, to the mineral matter of the soil, and certainly are the best means of improving it.

I will next place before the reader

An analysis of the soil of Haarlem Lake, in Holland.

	Dried at 212°
*Organic matter and water of combination,	14.71
Oxides of iron and alumina,	9.27
Sulphate of protoxide of iron, (green vitriol,)	.74
Bi-sulphide of iron, (iron pyrites,)	.71
Sulphuric acid united with oxide of iron as basic sulphate,	1.08
Sulphate of lime,	1.72
Magnesia,	.73
Phosphoric acid,	.27

Potash,	.53
Soda,	.32
Chloride of sodium,	.09
Insoluble siliceous matter, (clay,)	69.83
	100.00

---

*Containing nitrogen, .52
Equal to ammonia .63

This soil abounds in all the mineral elements which enter into the composition of the ashes of plants, and is especially rich in phosphoric acid; it moreover contains a considerable proportion of organic matter, capable of yielding on decomposition, rather more than one-half per cent. of ammonia, but unfortunately it is impregnated with sulphate of iron, which neutralizes all its useful properties, rendering it unproductive.

An interesting circumstance may be mentioned in connection with the field from which this soil was taken. Before it came into the hands of its present proprietor, the land was only slightly scratched on the surface as a preparation for the next crop, and then produced scanty, but still remunerative crops. Not satisfied with that yield, Mr. Wilson, an enterprising Englishman, the present owner of the land, ploughed deep, and to his astonishment found this attempt to improve its productiveness result in a complete failure of his corn crop. A heavy dressing of barn-yard manure proved equally unsuccessful, or rather aggravated the evil; for after the application of the dung even the deeper-rooting weeds were affected, and nothing but surface weeds would grow. This curious circumstance led to a chemical examination, which was committed to me.

The preliminary examination showed at once that there was present some injurious substance, for the wetted soil strongly discolored the blue litmus-paper. The acid reaction I found was caused by sulphate of iron, and I also succeeded in detecting sulphide of iron and iron pyrites. As long as the land was left unploughed, the latter constituent was not brought to the surface, and most of the iron existing there was no doubt gradually removed into the subsoil by the rain, which accounts for the better crops when the subsoil was unstirred. By deep cultivation the sulphide of iron was turned up and air admitted into the soil more freely, which had the effect of oxydizing the iron pyrites, and changing it into green vitriol. As the available mineral elements and soluble salts in the land were already rather in excess of the amount which is beneficial, the dressing of farm-yard manure, containing a good deal of soluble matter, could only aggravate the evil.

The proper remedy for such a state of things is a heavy dressing of lime, marl or chalk; for quicklime, or the lime in marl or chalk, decomposes sulphate of iron, and uniting with the liberated sulphuric acid, gives rise to gypsum—a useful fertilizer—and to oxide of iron, which occurs in all fertile soils. In the case before us, my recommendation to apply a heavy dressing of lime was adopted with complete success.

Since green vitriol, as well as iron pyrites, sometimes occurs in subsoils, care should be taken to test the subsoil, before the operation of subsoil ploughing is commenced, for such injurious matters, which it is better not to bring to the surface.

The particulars here related afford a complete answer to those who contend that chemical analyses of soils are of no use whatever to the farmer.

The following analysis shows the

Composition of a soil reclaimed from the sea, on the Hampshire Coast.

Water,	5.45
Organic matter and water of combination,	9.93
Oxides of iron and alumina,	7.18
Sulphate of protoxide of iron (green vitriol),	1.39
Bi-sulphide of iron (iron pyrites),	.78
Sulphate of lime	.34
Magnesia,	.51
Chloride of sodium,	.04

Potash and soda,	.83
Insoluble silicious matter,	73.55
	100.00

The constitution of this soil is very similar to that reclaimed from the Haarlem Lake; the remarks on the preceding analysis, therefore, apply with equal force to this, which is given as an example of the occurrence of land in England poisoned by green vitriol.

More recently I had an opportunity of inspecting a field near Sandy, in Bedfordshire, a portion of which was so completely sterile that not a weed nor a single blade of grass could be seen on it. The following is its analysis:

Composition of a completely barren soil, from Sandy, in Bedfordshire.

	Dried at 212°
Organic matter and water of combination,	4.27
Oxides of iron and alumina,	3.84
Phosphoric acid,	.09
Sulphate of lime,	.85
Magnesia,	.96
Potash and soda,	.47
Sulphate of iron (green vitriol),	1.05
Sulphide of iron (iron pyrites),	.56
Insoluble siliceous matter (chiefly sand),	87.91
	100.00

Here again we we find sulphate as well as sulphide of iron in appreciable quantities. Tested with litmus-paper, this soil showed a strong acid reaction, and when heated in a platinum capsule gave off pungent fumes of sulphurous acid. Soils in a healthy condition, it may be remarked, when heated do not give pungent vapors, smelling like those of a lighted sulphur match. This is itself a tolerably sure sign of the presence of injurious iron compounds.

The color of this soil was a dark gray, almost black, and yet it will be seen that the proportion of organic matter in it is not large. The dark color was therefore due, not so much to organic matter, as to finely divided sulphide of iron. In such a state of division, very little of it imparts a dark gray color, and particularly noxious properties, to a large mass of soil.

Where such dark soils occur, the air in the neighborhood is charged at times with fœtid vapor, smelling faintly like rotten eggs. This smell is produced by the action of the carbonic acid of the air upon the black sulphide of iron in the soil. Acids, not excepting the weak corbonic acid in the diluted state in which it occurs in the atmosphere, on the point of mixture disengages from sulphide of iron sulphuretted hydrogen, a gas highly injurious to vegetable as well as animal life. Chemical reactions are generally intensified by elevation of temperature, and thus the emission of sulphuretted hydrogen from the land impregnated with black sulphide of iron, is greater in summer than in winter. In my opinion, sulphuretted hydrogen does more mischief than even green vitriol. for direct experiments made by Dr. Christison and others have shown that even in a highly diluted state, sulphuretted hydrogen is injurious to vegetation, and, in a more concentrated state, is capable of destroying vegetable life as readily as that of animals.

All saline matters which are very soluble in water, as noticed above, are injurious to vegetation when they occur in the soil in too large a proportion. The principal question is, what is too large a proportion? An answer has been given lately to this question in the highly interesting scientific experiments on the nutrition of plants, by Professor Knop, of Leipsig, who found that solutions containing in all, not more than one part of soluble mineral matter to one thousand parts of water, are fully as strong as liquids should be from which plants are to derive food and grow luxuriantly. In solutions stronger than this, plants either grow languidly, or die altogether, although the same mineral substances are employed which, in the highly diluted state, are most active promoters of vegetation. If such be the case with solutions, my own experience leads me to infer that the soil itself should not contain more than one-sixteenth per cent. of such soluble substances, and therefore, that soils which contain several per cent. of common salt, nitrate of lime, or chloride of potassium, are unfit to maintain vegetable life in a healthy state.

I have met with several extraordinary soils, upon which nothing would grow, evidently because they were overcharged with soluble saline matters. An axample of this kind is given in the subjoined analysis:

Composition of a Soil impregnated with Salts and Nitrates.

Moisture,	10.86
*Organic matter,	4.64
Oxides of iron and alumina,	11.28
Phosphoric acid,	2.35
Equal to bone-earth,	(5.08)
Carbonate of lime,	5.21
Containing nitric acid,	(1.526)
Chloride of sodium,	11.61
Chloride of potassium,	2.31
Insoluble siliceous matter,	49.22
	100.00

---

*Containing nitrogen, .24
Equal to ammonia, .29

We have here a large proportion of common salt, and also chloride of potassium and nitrate of lime, two salts still more soluble in water than chloride of sodium. The nitrate of lime is evidently a product of the oxydation of animal matter, the presence of which, in this curious soil, is distinctly evidenced by the simultaneous occurrence of phosphate of lime (bone-earth) in considerable quantities. We have here presented to us a true nitre-earth which valuable as it is, unquestionably, when applied as manure, is far too rich in saline constituents to be cultivated like an ordinary soil.

In concluding this section of the subject, it may be well again to mention briefly the various matters and conditions which render some soils barren or unproductive. They are the following:

(*a.*) Superabundance of organic (humic) acids.

(*b.*) Sulphate of iron, (green vitriol,) even when present in the soil in small quantities.

(*c.*) Sulphide of iron (iron pyrites), and especially finely divided black sulphide of iron, which in the smallest proportions, is most pernicious to plants.

(*d.*) Abundance of protoxide of iron, and absence of peroxide, indicating a bad physical condition of the land.

(*e.*) Chloride of sodium (common salt) in proportions of 1-16th per cent. and upwards.

(*f.*) Nitrates, and all soluble saline matter, in quantities exceeding small fractions of 1 per cent. of the whole mass of soil.

2.—*Soils are Unproductive when they are deficient in one or more constituents found in the Ashes of our Cultivated Plants.*

By far the greatest number of soils as we find them in this and other countries, are poor in phosphoric acid; for which reason phosphates in an available condition are generally useful as fertilizers. In some soils this deficit is very marked.

Thus in the following analyses we have merely traces of phosphoric acid:

Composition of Soils deficient in Phosphoric Acid.

	Sandy Soil.	Clay Soil.	Clay Soil.
Moisture,	....	10.06	12.37
Organic matter,	3.02	7.69	8.07
Oxides of iron and alumina,	4.34	13.36	14.45
Phosphoric acid,	.07	.04	.01
Sulphate of lime,	.07	.17	.14
Carbonate of lime,	.17	.24	none.
Potash and Soda,	.26	1.65	1.21
Magnesia,	.41	.46	.37
Insoluble siliceous matter,	91.63	66.33	63.38
	100.00	100.00	100.00

I have selected for illustration one sandy and two clayey soils, in order to show that the same defect may exist in soils of diametrically opposite physical characters. Those who pretend to form a just estimate of the agricultural capabilities by mere classification and examination of their mechanical condition, make as great a mistake as men who hastily form an opinion of the quality of a sample of guano or superphosphate by handling and smelling it.

Experience, indeed, shows that there are poor clays as well as poor sands, and on the other hand, rich clays and very fertile sands. If we examine carefully these differences in the only way in which they can be examined with certainty, that is by chemical analysis, we often find that the relative productiveness of different soils to be intimately connected either with abundance or deficiency of phosphoric acid.

Another substance which sometimes only exhibits traces and often occurs in too small a proportion, is lime. The practice of liming and marling which prevails in many districts in England is a proof of the want of lime in many light as well as heavy soils. In the following table I have incorporated the analyses of various kinds of soils which are benefitted by the direct application of lime or chalk:

Composition of Soils deficient in Lime.

	No. 1.	No. 2.	No. 3.	No. 4.
	Sandy soil from Kent.	Stiff pasture from Sommersetshire.	Clay soil from Demarara.	Peat land from Kenmore, Sommersetshire.
Moisture,	....	....	7.03	....
Organic matter,	3.62	16.80	12.58	55.32
Oxide of iron and alumina,	7.50	16.08	11.10	13.08
Phosphoric acid,	.13	....	.48	.06
Sulphuric acid,	....	....	.11	1.20
Lime,	.43	.75	.13	.97
Magnesia,	.49	.56	.33	.54
Potash and soda,	.48	.45	.52	1.02
Insoluble and siliceous matter,	87.35	64.36	67.72	27.81
	100.00	100.00	100.00	100.00

This last might have been much extended, but the preceding examples will suffice in illustration of the deficiency of lime in peaty, clay, sandy and pasture soils. The want of alkalies, more especially of potash, is I believe, a far more common cause of the compartive sterility, which characterizes some land, than is generally believed to be the case. If we look at the composition of the ashes of all farm produce, we shall find that a very large proportion of their ashes consists of potash. This constituent, of course, must be supplied either by the soil or in the manure with which the soil is dressed. Root-crops especially have ashes rich in potash; and as turnips are often grown on land naturally poor in alkalies, with purely mineral superphosphate of lime and nothing else, and the produce is sometimes sold off the land, or not consumed entirely upon it, the land may thus become drained of its available potash to an injurious extent. Perhaps the failure of roots on land which formerly produced good crops may have something to do with the gradual extraction of their available alkalies. At any rate it is well to remember that many soils are very poor in alkalies, and that in all fertile soils the amount of potash and soda is always considerable.

It is a prevailing idea that light, sandy land alone, is likely to be deficient in potash; and it is true that this want does not so frequently affect clay land; but at the same time, it is no less true, that some clays are almost as poor in alkalies as the worst kinds of sandy soils. In proof of this I may give the subjoined recent analyses of mine, of a strong clay and a light sandy soil:

Composition of a Strong Clay and a Sandy Soil.

	Strong Clay Soil.	Light Sandy Soil.
Moisture,	4.01	....
Organic matter and water in combination,	8.51	6.92
Oxides of iron and alumina,	11.24	6.43
Phosphoric acid,	.06	.11
Sulphuric acid,	.19	....
Lime,	none	.65

Magnesia,	.46	.39
Alkalies, (potash and soda,)	.45	.33
Insoluble siliceous matter,	75.08	85.17
Chiefly,	(clay)	(sand)
	100.00	100.00

In these two soils, potash and soda are evidently deficient; at the same time it will be noticed that both are poor in phosphoric acid; that there is no lime in the clay, and but little in the sandy soil. Unproductive soils are seldom deficient in one substance only; for this reason many cannot be made fertile by the application of manures which, like lime, supply only one material. Their general deficiency in all these important elements of fertility is clearly seen in the following analysis, showing the—

Composition of a Poor Sandy Soil.

Moisture,	4.78
Organic matter,	1.03
Oxides of iron and alumina,	1.72
Lime,	.19
Magnesia,	.10
Potash,	.23
Soda,	none.
Phosphoric acid,	.04
Sulphuric acid,	.12
Carbonic acid and chlorine,	traces.
Insoluble siliceous matter, 91.79; consisting of—	
Silica,	89.32
Alumina,	1.81
Lime,	none.
Magnesia,	.36
Potash,	.15
Soda,	.15
	100.00

It will be seen at a glance that this is a hungry soil, which requires lime as well as phosphoric acid and alkalies. As long as we do not possess a cheap source of potash, well made yard-dung, liberally applied, seems to be our only generally available resource for maintaining or increasing the productiveness of soils as poor and defective as this. It is upon soils of that character that town-sewage produces the best economical results, when applied in large quantities. We have seen in this section, that soils are often unproductive, because they are deficient—

(*a.*) In lime.

(*b.*) In phosphoric acid.

(*c.*) In potash.

(*d.*) In two or more of these important ash-constituents of plants.

3.—*Soils are barren or unproductive when they contain a large preponderance of organic matter, or of sand, lime, or even of pure clay.*

The most fertile soils, such as alluvial deposit or warp land, may be regarded as intimate mechanical mixtures of clay, lime, sand, and organic matter in which no one of these essential components predominates, so as to give the mixture the character of a clay or sandy soil, or to show in too marked degree the properties of lime or organic matter.

On the other hand, sterility or comparative unproductiveness is often caused by such a preponderance in the soil of one of these. Each of these ingredients of all fertile soils possesses special chemical and physical properties conducive to the development of plants, and it will be readily understood how essential to luxuriance of growth is their intimate and nicely proportioned mixture, such as we find it in alluvial soils.

The following table illustrates the composition of soils which are unproductive on account of the preponderance of one of the four chief materials of all soils:

Composition of unproductive Peat-land, Clay, Calcareous and Sandy soils.

	No. 1. Calcareous Soil.	No. 2. Sandy Soil.	No. 3. Clay Soil.	No. 4. Peaty Soil.
Moisture,	....	2.65	....	....
Organic matter and water of combination,	....	4.56	7.94	49.07
Oxides of iron and alumina,	7.80	5.93	10.95	10.88
Carbonate of lime,	73.807	.39	.86	2.29
Magnesia,	.825	....	.26	.75
Potash and soda,	traces.	.28	.39	.90
Phosphoric acid,	.242	....	.10	.06
Sulphuric acid,	1.546	....	.30	1.04
Silica,	16.710	86.19	....	....
Insoluble siliceous matter (fine Clay),	6.090	.79	.20	35.01
	100.000	100.0000	1.00	100.00

4.—*Soils are unproductive when a thin layer rests on the bare rock.*

I am acquainted with several localities where the soil is of excellent quality, but too near the rock to be productive. We should bear this in mind in discussing the state of agriculture in different countries or districts, as this obstacle will baffle the utmost skill of the agriculturist, though he might fertilize the barren sand, or reclaim the unhealthy swamp.

5.—*Soils are unproductive when they rest on impervious clay sub-soils which are not easily drained efficiently.*

A good deal of clay land, I believe, is unproductive solely because it rests on impervious stiff clay, probably 30 or 40 feet in thickness. Ordinary drainage, I fear, although it improves the character of such clay land to some extent, does not make sufficient impression upon its physical condition. Clay soils of that description occur in the lias formation, where they are known as scouring land, on account of the tendency of the herbage to scour sheep and cattle. Some time ago I made an analysis of notoriously bad land from Shepton-Mallet, Sommersetshire. The soil contained in 100 parts:

Moisture,	4.45
Organic matter and water of combination,	14.40
Oxides of iron, and alumina and phosphoric acid,	14.45
Sulphate of lime,	.26
Carbonate of lime,	14.80
Magnesia,	.96
Potash and soda,	.93
Insoluble siliceous matter, (chiefly clay,)	49.66
	100.00

The soil had rather a dark color, which was due partly to the large proportion of organic matter which enters into its composition. Although not injurious in itself, an excess of organic matter, as well as protoxide of iron, indicates a condition of the land which is unfavorable to the healthy growth of plants. In a porous well-cultivated soil, freely penetrated by the atmosphere, the accumulation of organic matter never becomes excessive, nor does such soil contain much protoxide of iron. The presence of the latter in considerable proportions always shows that the soil is not sufficently aërated to produce a healthy and nutritious herbage.

Chemically considered, this soil contains an abundance of all the mineral element which enter into the composition of the ashes of plants, and it is found in practice that farm-yard manure does not produce any marked effect upon it, which shows plainly that it is not the want of plant-food that renders it unproductive. These lias lands rest upon a clay bed of great depth which approaches very near to the surface.

In many instances therefore, underdrainage, besides taking off the surface water, produces little alteration in the condition of the surface soil, for the simple reason that it is too thin and the clay subsoil too tenacious and too deep to be penetrated to any extent by the ameliorating influence of the atmosphere. These tenacious soils are consequently damaged by excess of water and coldness, which retard vegetation and make it very gradual during the early months of the year.

6.—*Soils are unproductive when Drainage is Defective.*

Under this head I need not offer any observations, for it is now perfectly well known that bad drainage is a frequent source of sterility in land, which has only to be thoroughly drained in order to become permanently improved.

7.—*Soils are unproductive when their physical characters are bad.*

An actual case lately brought under my notice will best illustrate this part of my subject. A correspondent wrote to me last spring from Churchdown, near Gloucester:

"SIR—I have this day forwarded to you a bottle of earth for analysis. The land has been laid down to permanent pasture five years; the first year or two it grew luxuriant crops, but now it is almost worthless, although it has been dressed with different kinds of compost. With the analysis please give to me what sort of manure would be most likely to bring it to a state of fertility."

On analysis the soil yielded the following results :

Moisture,	4.04
Organic matter and water of combination,	11.66
Oxides of iron and alumina and phosphoric acid,	16.67
Carbonate of lime,	10.03
Magnesia,	1.38
Potash and soda,	1.01
Insoluble siliceous matter, (clay,)	55.21
	100.00

This soil ought to yield good crops, for it contains all the elements of food required by plants. It certainly is not unproductive because it is deficient in any one element of vegetable food, but I believe, because its physical condition is such as not to allow the plants to avail themselves of the food which is unquestionably present in the soil. It contains, it will be seen, a good deal of organic matter, and is a very stiff and retentive soil, difficult to drain. Surface water is removed readily enough by drainage from such land: this is one thing; but to make it sufficiently porous by draining to allow the water, and after it the air to pass through the soil, is quite another matter. The soil appears to have grown luxuriant crops a year or two after it was laid down in permanent grass, and then to have become almost worthless. I can readily understand this, and have no doubt if the land were again broken up, its previous fertility would be resumed, without the addition of manure. Retentive clay soils having a composition like this, do not require manure, but must be penetrated by the air, which is freely admitted when land is broken up. In the course of a year or two, however, the pores of such land again become closed up; and in consequence of the exclusion of the air, and not for want of mineral food, vegetation becomes languid in growth.

On land like this it is only a waste to apply manures, especially if the season should be dry. Artificials, such as guano or ammoniacal salts, then do positive harm; and in warm seasons, water itself is the best manure, developing, so to speak, the natural resources of the land and encouraging the growth of the herbage. It is not for me to say whether it is profitable to put such land down in permanent pasture or to break it up and adopt upon it a rotation suited to heavy clay land; but of this I am quite certain, that the *steam cultivator* would do wonders on these cold, stiff clays, for they contain, practically speaking, an inexhaustible store of mineral food of plants, which, however, has to be unlocked, as it were, by the air. The more roughly stiff clays are broken up the better; the less the farmer meddles with the land when once broken up, the more effectually the air will find access into the land. No implement can properly pulverize clays so effectually as air and frost, if time be allowed.

Having spoken at some length of a variety of conditions which appear to me to affect fertility of land, my subject may perhaps be usefully brought to a close by a brief statement of what, in my opinion, the chemical analysis of soils can determine, and what it necessarily must leave undecided.

In the first place I would remark that the chemical analysis of soils can give very decided answers to the following questions:

1. Whether or not barrenness is caused by the presence of an injurious substance, such as sulphate of iron or sulphide of iron?

2. Whether soils contain common salt, nitrates, or other soluble salts, that are useful when highly diluted, but injurious when they occur too abundantly?

3. Whether or not barrenness is caused by the preponderance of—

Organic matter, or
Lime, or
Sand, or
Pure clay?

4. Whether sterility is caused by the absence of—

(*a.*) Lime.
(*b.*) Phosphoric acid.
(*c.*) Alkalies, especially potash.
(*d.*) Or available mineral (ash-constituents) matters generally?

5. Whether clays are fertile or barren?

6. Whether or not clays are usefully burnt and used in that state as manure?

7. Whether or not land will be improved by liming?

8. Whether it is better to apply lime, or marl, or clay on a particular soil?

9. Whether special manures, such as superphosphate or ammoniacal salts, can be used (of course discreetly) without permanently injuring the land, or whether the farmer should rather depend upon the liberal application of farm-yard manure that he may restore to the land all the elements of fertility removed in the crops?

10. What kind of artificial manures are best suited to the soils of various composition?

11. Whether deep ploughing or steam cultivation is likely to be useful as a means of developing the natural stores of plant-food in the soil?

12. Whether the food of plants in the soil exists in an available or inert condition?

On all these points, chemical analysis can give reliable information, provided the results are rightly interpreted. The best answer to a question does not necessarily convey useful information to him who puts it: in the same way the most careful analysis does not always give a satisfactory answer, even on points on which a chemist can pronounce with some degree of assurance. A knowledge of chemistry does not put the analyst of a soil into possession of that amount of acquaintance with practical agriculture which is necessary to enable him to interpret analytical results, and to recognize their bearing upon purely practical matters. In the hands of a chemist perfectly ignorant of the first rudiments of practical agriculture, soil-analyses, it appears to me, are about as useful as, without comment, they are to a farmer who does not know the difference between phosphate and sulphate of lime, or between potash and soda.

There was a time when I thought with many other young chemists, that soil-analyses would do everything for the farmer; three or four years of further experience and hard study rather inclined me to side with those men who consider that they are of no practical utility whatever; and now after eighteen years of continued occupation with chemico-agricultural pursuits, and, I trust with more matured judgment, I have come to the conclusion that there is hardly any subject so full of practical interest to the farmer as that of the chemistry of soils--the longer and more minutely soil investigations are carried on by competent men, the greater, I am convinced, will be their practical utility.

As pointed out in the preceding brief summary, already a good many practical questions may be put to the agricultural chemist with propriety, which I should have hesitated or altogether refused to answer three or four years ago.

It remains for me now to mention, briefly, some points relating to barrenness of soils on which chemical analysis cannot supply any definite information. It cannot decide, amongst others:

1. Whether barrénness is caused by defective drainage.

2. To what extent sterility is affected by a bad physical condition of the land.

3. How far unproductiveness is connected with the climate, aspect or elevation of the land in question.

4. That a soil is barren chiefly because there is too little of it, or

5. That it is unproductive simply because a thin surface soil rests on a stiff clay subsoil of great depth.

6. What is the relative productivenes of different soils.

There are other matters in connection with this subject on which soil-analyses cannot possibly give any information. It is well to bear in mind that some matters affecting the fertility of land can be most positively decided by analysis, and others not; for if this is neglected the agriculturist will not reap the practical benefit which the chemical examination of soils is well calculated to confer in most cases.—*Journal of the Royal Agricultural Society of England.*

THE STATE AGRICULTURAL COLLEGE.

The management of this Institution continues to be the same in principle that it has been since its reorganization in 1861, and is in conformity with what was then laid down as its objects, viz:

1. To impart a knowledge of science and its application to the arts of life—especially the sciences which relate to agriculture and kindred arts.

2. To afford students the privilege of daily manual labor, the advantage of which is, primarily, educational, as illustrating the principles of science, and imparting a taste for agricultural pursuits, but designed in some degree, as a means by which students may partly defray their expenses.

3. To prosecute experiments for the settlement of various important questions connected with agriculture.

4. In accordance with the organic law of the College as well as the Act of Congress donating lands for agricultural colleges, to give instruction in the military art.

5. To afford the means of a general education to the farming class.

The number of students in the Institution during the past year was eighty-eight—about as large a number as could be received with the present accommodation for board and rooms. It is evident that under the improvements which experience suggests, and the increase of facilities of communication with the different parts of the State, the Institution is becoming better known and appreciated.

In regard to the management of the farm, it may be remarked that considerable advance has been made during the past year in the preparation of the surface for the unobstructed use of the plough and field machinery. With the lspse of time and the changes which it produces or permits, the management may approximate more and more to a system adapted to illustrate the principles of agriculture and the true economy of husbandry.

The character of the past season as affecting the crops of the farm, was in some respects quite unfavorable. The constant wet weather immediately preceding and during the time of wheat harvest, was decidedly injurious to that crop, developing rust and damaging the grain both from that cause and from imperfect curing. The wheat midge also attacked the crop in immense numbers, and aided in its destruction. The root-crop, too, was unfavorably affected by the wetness of the season, especially some of the turnips, which rotted in the ground.

Oats yielded well, though they were injured in quality somewhat, both in the straw and grain, by the frequent rains. A trial with a variety of black oats presented by Mr. A. S. Brooks, of Novi, indicates their superiority over the common kind—the straw being lighter and the grain heavier. The Indian corn crop turned out well, although a considerable portion of the first planting was destroyed by the cut-worm.

The grass-crop, both in reference to hay and pasturage, made a constant growth through the season. The unfavorableness of the weather, however, at the period of hay-making, prevented the perfect curing and caused the cutting of a portion of the grass to be too long deferred to make hay of the best quality.

It is intended to make the rearing of stock a prominent feature in the husbandry of the College Farm. But few animals, however, have been sold during the past year, from the fact that it was desirable to increase the herd; and the animals of improved breeds which have been introduced being mostly young, time was necessarily required for them to attain the proper age for breeding. Several of them have now reached this age, and it is reasonably expected that proceeds from this source will in future be realized. The Ayrshire bull and heifer added to the herd in the fall of 1864, have thriven well. The heifer has not yet had a calf.

Trials have been made in crossing short-horn and Devon bulls on the common or so-called native cows of the farm. The results thus far seem to be in favor of the Devon. Two-year-old steers of this cross, reared in the ordinary way, and wintered in 1864-5 wholly on corn-fodder and straw, and kept afterwards on grass only, were sold to the butcher in July, for fifty dollars per head, and gave a dressed weight of about seven hundred and fifty pounds each. Several heifers reached nearly the same size, with a greater degree of fatness. And here it is proper to remark, that the *quality* of the beef in the animals slaughtered, was much superior to that generally obtained in stock of their age, or even older. During the coming season we shall have the opportunity of comparing half-blood short-horns and half-blood Devons of the same age—yearlings and two-year-olds.

The experiments in top-dressing grass-lands commenced in 1863, have been continued, and a report thereon by Professor Miles, herewith appended, will show the results for the past season.

Among the permanent improvements of the farm, effected during the past year, is the erection of a sheep-barn. The plan is believed to combine important advantages in reference to winter accommodations for sheep of different ages and conditions, with economical and convenient modes of feeding, watering, &c.

The buildings still needed by the Institution, are a piggery, tool-house, wood-house, granary, and green-house.

The following statement of the Farm Superintendent, Prof. Miles, shows the receipts and expenditures of the farm for the past year:

Statement of Receipts and Expenditures of College Farm for the year ending December 1*st,* 1865.

Amount of bill against Boarding Hall,	$1,523 33
Cash sales of Stock,	396 88
" " Produce,	152 43
141 bush. Wheat, at $1 25,	176 25
625 " Oats, at 30 cts.,	187 50
98 tons of Hay, at $10,	980 00
125 bush. Carrots, at 30 cts.,	37 50
195 " Beets, at 30 cts.,	58 60
600 " Turnips, at 25 cts.,	150 00
1400 " Corn, (ears,) at 30 cts.,	420 00
Value of Corn fodder and Straw,	60 00
Wood furnished Boarding Hall,	129 64
" " College Hall,	93 75
Amount charged Hort. Dept. for keeping team,	188 00
Eight Ewe Lambs, (two South Down and six Merino,)	115 00
Five Ram Lambs, (Merino,)	200 00
Forty grade Lambs,	100 00
Four Bull Calves,	200 00
Nine grade Calves,	90 00
	$5,258 70

FARM EXPENSES.

Amount paid for Stock,	$ 522 40		
Paid for Implements, repairs and incidentals,	365 86		
Labor of Students on farm,	594 33		
" Men, and board at $2 50 per week,	346 83		
" Students in shop, making Implements, repairs, &c.,	36 94		
		$1,866 36	

PERMANENT IMPROVEMENTS.

Labor of men, and board at $2 50 per week,	$ 834 41		
" Students,	226 69		
Amount paid for Sheep Barn,	1,767 59		
		$2,828 69	
Profits of Farm above expenses and amount expended in permanent improvements, including sheep barn,		563 73	
			$5,258 78

In the Horticultural and Garden departments, the operations of last year were generally successful. The apple-orchard fruited for the first time, good specimens of seven varieties having been obtained, viz: Rhode Island Greening, Autumn Pearmain, Baldwin, Pomme Gris, Northern Spy, Danvers Winter Sweet, Roxbury Russet. The trees were pruned and they are generally in a healthy, thriving condition.

Most of the trees comprising the pear-orchard made a fine growth; a few which were not good when they were set out have not grown very well. The ground which was not, at first favorable to trees, for reasons which have been mentioned in previous reports,. is beginning to show the benefits of underdraining, manuring and tilling, which will probably cause the trees to grow more rapidly than they have done. No crop has been cultivated on the ground, and no weeds permitted to grow. Considerable benefit is thought to have been derived from washing both the apple and pear trees with soap-suds.

The garden produced vegetables in great abundance, and of superior quality. The Superintendent of this department, Professor Prentiss, has produced a new variety of tomato of superior quality, which promises to be a decided acquisition. He proposes experiments in the production of seedling grapes, strawberries, &c., a field in which some of the most important results have already been obtained, and from which others of equal value may be expected.

The pecuniary returns from the Horticultural and Garden departments, are given as follows:

Sales to Boarding-Hall	$229 21
Cash sales, about	75 00
[These sales might have been greatly increased with better market facilities.]	
Vegetables stored,	190 00
	$494 21

To which, if the value of seeds on hand be added, the aggregate amount could not be less than $500.

There have been added to the stock of the farm by purchase, during the past year, the following animals:

A bull and heifer of the Galloway breed, purchased of John Snell, of Edmonton, Canada West. A description of this breed, and a more particular notice of the animals in question, will be found on pages 39 to 55 of this report.

A ram and two ewes of the Cotswold breed, purchased of the breeder above mentioned. This breed of sheep and the animals in question, are described in this report, pages 57 to 66.

The following have been received as donations:

Two ewes of the Wells & Dickinson stock of Merinos, with a ewe lamb of each, from Hon. Jesse Edgington, of Holliday's Cove, West Virginia. This variety and the animals here mentioned, are described in this report, pages 69 to 76.

A Silesian Merino ewe and her ewe lamb, from Wm. H. Ladd, of Richmond, Jefferson county, Ohio.

A full-blood Merino ram, from Henry Huff, of Jonesville, Michigan.

A South Down ram, from Hon. Ezra Cornell, of Ithaca, N. Y., bred from stock imported by that gentleman from the noted flock of the late Jonas Webb, of Babraham, England.

A ram and ewe of the Black-faced mountain breed of Scotland, from Hon. Samuel Campbell, of New York Mills, N. Y.

A Suffolk boar, from the Hon. John Wentworth, of Chicago, Illinois.

A Chester white sow, from Mr. Court, of Battle Creek, Michigan.

Implements, &c., have been received as follows:

Farmer's Root-Cutter, (improved,) from T. A. Flower, Pontiac, Michigan.

Reynold's Horse-Fork, from M. S. Baker, Lansing, Mich.

Patent Bag-Holder, from S. S. Rockwell, Lansing, Mich.

Patent Bag-Holder, from E. Reynolds, Corunna, Mich.

Right to use Hawkins's Patent Folding Hay-Rack, from Hawkins & Howe, Akron, Ohio.

Model of Olmsted's Revolving Landside Plow, and model of Adjustable Mould-board Plow, from D. S. Ayres & Co., Binghamton, N. Y.

Brinkerhooff's Patent Corn-Husker, from F. F. Fowler & Co., Upper Sandusky, Ohio.

Sample of Sorghum syrup and Sorghum seed, from M. L. Stevens, Perry, Shiawassee county, Mich.

Blank Sheep-Register, from C. H. Dana, West Lebanon, N. H.

Contributions to the Museum of the College have been received from Prof. J. C. Holmes, and Hon. Justus Gage.

For the Laboratory:—From George B. Smith, Alabaster Works, Detroit, beautiful specimens of alabaster and plaster, from the Alabaster Quarry, Iosco county, Mich.

W. P. Spaulding, specimens of silver-lead ore, from Marquette, Upper Peninsula, Mich.

We are indebted for additions to the College Library, as follows:

To the American Unitarian Association, for various books; Caleb Clark, various books; Prof. A. D. Bache, U. S. Coast Survey for 1862; Isaac Newton, Commissioner U. S. Agricultural Department, Annual and Monthly Reports; Essex (Mass.) Institute, Transactions; Ohio State Board of Agriculture, per J. H. Klippart, Secretary, Transactions for 1862, '63, '64; Massachusetts State Board of Agriculture, per Chas. L. Flint, Secretary, Transactions for 1864; Massachusetts Horticultural Society, per Eben Wight, Secretary, Transactions for 1865; New York State Agricultural Society, per B. P. Johnson, Secretary, Transactions for 1864; Maine State Board of Agriculture, per S. L. Goodale, Secretary, Transactions for 1864; Illinois Horticultural Society, per W. C. Flagg, Secretary, Transactions.

Public documents have been received from Hon J. M. Howard, Hon. Z. Chandler, Hon. J. W. Longyear, and Hon. Lewis Bollman.

From J. E. Tenney, State Librarian, we have received Laws of the United States, and Geology of Michigan.

Contributions to the Reading-Room have been received from A. Longley, Cincinnati, Ohio, and M. A. Dow. The Reading-Room has also been regularly supplied during the year, through the liberality of the publishers, with the Prairie Farmer, Genesee Farmer, Wisconsin Farmer, Hovey's Magazine of Horticulture, Lansing Republican, Ann Arbor Journal, Michigan Argus, Flint Citizen, Bay City Journal, and Railroad Record; and by the liberality of different individuals, with the Detroit Daily Advertiser, Tri-weekly Free Press, New York Semi-weekly Tribune, New York Semi-weekly Evening Post, Marshall Statesman, and Rural New-Yorker.

SANFORD HOWARD,
Secretary of the Michigan State Board of Agriculture.

REPORT

OF EXPERIMENTS IN TOP-DRESSINGS APPLIED TO GRASS-LANDS AT THE STATE AGRICULTURAL COLLEGE FARM, 1865.

To the Faculty of the State Agricultural College:

The Committee on Experiments would respectfully present the following report for the year 1865:

The experiments commenced last year, in the application of top-dressings to grass-lands, have been continued for the purpose of ascertaining the effect of the fertilizers under observation on subsequent crops.

The pieces of land numbered from 1 to 8, containing each 45-100 of an acre, remain as they were last year after the removal of the crop, without any additional fertilizers having been applied. The soil is a light sandy loam, and was not considered to be in a high state of cultivation at the commencement of the experiments. The growth of the present year is mostly clover. We commenced cutting the first crop July 7, and hauled the last of it to the barn July 14. A heavy rain falling while the crop was in the cock, injured the quality of the hay, but as particular pains were taken to secure a uniform drying of each piece, the results, so far as the relative yield is concerned, were not affected.

For convenience of comparison the following table is given, showing the rate of yield per acre, gain per acre and per cent., together with the kind and amount of top-dressing:

Table 1.—*First Crop of* 1865.

Subdivision.	Yield in lbs.	Yield per acre in lbs.	Gain per acre in lbs.	Gain per cent. in lbs.	Kind and amount *per acre* of Top-Dressings applied in 1864.
No. 1	840	1,867	....	....	None.
No. 2	1,320	2,933	1,067	57	Two bushels of plaster.
No, 3	1,190	2,644	778	42	Five bushels of wood ashes.
No 4	1,340	2,978	1,111	59.5	Twenty loads of pulverized muck.
No. 5	1,640	3,644	1,778	95	Twenty loads of muck and 3 bu. of salt.
No. 6	1,580	3,511	1,645	88	Three bushels of salt.
No. 7	1,730	3,844	1,978	106	Twenty loads of Horse manure.
No. 8	1,490	3,311	1,445	77	Twenty loads of cow manure.

The second crop was cut and hauled to the barn between the 5th and 11th of October. It was cured in the cock in the same manner as the first crop, and stirred out before hauling. The results are given in the following table:

Table 2.—*Second Crop of* 1865.

Subdivision.	Yield in lbs.	Yield per acre in lbs.	Gain per acre in lbs.	Gain per cent. in lbs.	Kind and amount *per acre* of Top-Dressings applied in 1864.
No. 1	400	889	....	....	None.
No. 2	720	1,600	711	80	Two bushels of plaster.
No. 3	526	1,169	280	31.5	Five bushels of wood ashes.
No. 4	534	1,187	298	33.5	Twenty loads of muck.
No. 5	610	1,356	467	52.5	Twenty loads of muck and 3 bu. of salt.
No. 6	786	1,747	858	96.5	Three bushels of salt.
No. 7	970	2,156	1.267	142.5	Twenty loads of horse manure.
No. 8	960	2,133	1,245	140	Twenty loads of cow manure.

The following table shows the yield per acre, gain per acre, and gain per cent., of both crops, for each of the years 1864 and 1865:

Table 3.

Subdivision.	1st and 2d crop of 1864.			1st and 2d crop of 1865.			KINDS OF TOP-DRESSING.
	Total yield per acre in lbs.	Total gain per acre in lbs.	Gain per cent. in lbs.	Total yield per acre in lbs.	Total gain per acre in lbs.	Gain per cent.	
No. 1	4,598	....	....	2,755	....	....	None.
" 2	6,973	2,875	51.6	4,533	1,778	64.5	Plaster.
" 3	7,492	2,894	62.9	3,813	1,058	38.4	Ashes.
" 4	7,872	3,274	71	4,164	1,409	51	Muck.
" 5	7,661	3,063	66.6	5,000	2,245	81.5	Muck and Salt.
" 6	6,280	1,682	36.6	5,258	2,503	90 8	Salt.
" 7	6,386	1,788	38.8	6,000	3,245	117.7	Horse manure.
" 8	6,787	2,189	47.6	5,444	2,689	97.6	Cow manure.

From this table it will be seen that the crop of 1865 is considerably less than that of 1864. Piece No. 7, (dressed with horse manure,) shows the smallest decrease in the crop *per acre,* the difference being only 386 lbs., while the other pieces show a decrease *per acre* of from 1,022 to 3,708 lbs.

In comparing the gain *per cent.,* however, we find, (with the exception of Nos. 3 and 4,) that each piece shows an increase in the crop of 1865 over that of 1864. The increase *per cent.* in No. 2, dressed with plaster, is from 51.6, in 1854, to 64.5, in 1865.

No. 5, dressed with muck and salt, shows an increase of gain of from 66.6 per cent., in 1864, to 81.5 per cent., in 1865.

No. 6, dressed with salt, shows an increase of gain from 36.6 per cent., in 1864, to 90.8 per cent., in 1865.

No. 7, dressed with horse-manure, shows an increase of gain from 38.8 per cent. in 1864, to 117.7 per cent. in 1865.

No. 8, dressed with cow-manure, shows an increase of gain from 47.6 per cent. in 1864, to 97.6 per cent. in 1865.

It is worthy of notice, likewise, that the *gain per acre* in pieces Nos. 6, 7 and 8 is decidedly increased in the crop of 1865, while in the remaining pieces (Nos. 2, 3, 4 and 5,) the gain per acre is greatest in the crop of 1864.

The results of these experiments, so far as they can be ascertained by observations extending through but two seasons, show that the value of manures is too generally underrated.

The following table shows the amount and kinds of manures used in the experiments, and the increase in the crops obtained:

Table 4.

Kind and amount of fertilizers applied in 1864.	Increase of crop in two years, viz., 1864 and 1865.
2 bushels of plaster,	4,153 lbs. of hay.
5 " " wood ashes,	3,942 " " "
20 loads of muck,	4,683 " " "
20 " " " and 3 bushels of salt,	5,318 " " "
3 bushels of salt,	4,184 " " "
20 loads of horse manure,	5,023 " " "
20 " " cow "	4,874 " " "

By reference to table 2, giving the results of the 2d crop of 1865, it will be seen that the pieces dressed with salt, horse manure and cow manure give a greater gain *per cent.* than had been obtained in any of the three preceding crops. It is therefore probable that their effects will be seen in the crops of next year to an extent that will add materially to the value of their proceeds given in table 4.

It is proposed to continue the experiments already commenced, so as to determine how long the effect of the single application of the top-dressing will be shown in the increase of the crop.

As the top-dressing of grass-lands is now engaging the attention of farmers to a considerable extent, it is hoped the observations herewith presented, may be of use in showing the benefit to be derived from this method of applying fertilizers.

M. MILES,
Chairman of Committee on Experiments.

OBSERVATIONS ON THE METEOROLOGY OF CENTRAL MICHIGAN.

BY R. C. KEDZIE,

PROFESSOR OF CHEMISTRY IN THE MICHIGAN STATE AGRICULTURAL COLLEGE.

The climate of any region being so intimately connected with all the processes of vegetable growth and the development of those productions necessary for the sustenance of animal life, it would naturally be expected that meteorology would interest farmers to such a degree that they would need no urging to cultivate and advance this science. But the results sought and the means for their attainment seem so far apart, that many regard the objects visionary, and the means trifling. To note the rise or fall of mercury in certain glass tubes, to determine the course of the wind and mark the form of the clouds three times a day, and in addition, to measure the amount of rain—what have they to do with raising corn or wheat—with the culture of fruit or care of stock? The fickle winds, the ever-changing clouds, the inexplicable fluctuations of heat and cold,—what interest can these have to a man in earnest about life's duties and cares—to a farmer in choosing his home, in clearing his farm, or in planting his orchard? And yet these apparently trivial observations do bear upon all these questions, and the importance of this subject to farmers, is my excuse for urging upon them the need of observations in various parts of the State, in order that the meteorology of our Lower Peninsula may be better understood.

Any one who has noticed the physical geography of our State, must be struck by the remarkable chain of lakes, which, with their connecting rivers, sweep our western, northern and eastern borders, leaving only our southern boundary open. Every one aware of the controlling influences exerted by *open water* over climate, must regard these lakes as a very important feature of our physical geography; and when he casts his eye upon the river system of our interior, and sees one set flowing from a common center—in fact from a single township—and diverging to Lake Michigan, to Saginaw Bay, to Lake St. Clair, to Lake Erie, and Maumee River, and casting his eye farther north and observing the interlacing and overlapping of the water-courses of this region along a line a little west of the principal meridian, it must be evident to such an one, that a region rising so gradually, almost imperceptibly, from its water line, must be greatly influenced by these noble inland seas.

But what is the influence of this water system? Is its influence equal in all directions? To what distance does it extend? Is its influence so permanent and controlling that we may safely disregard other means of influencing climate more immediately within our power? It is of importance for the farmers of this State to have these and similar questions answered, and the most promising means of settling these points, is by comparing observations carefully made in different parts of the State.

The instruments necessary for such observations are not expensive or difficult to use. The barometer is the most expensive, but a good mercurial barometer can now be obtained for $15 to $25. Two thermometers, one to use as a "dry bulb" and the other as "wet bulb," can be obtained in most of the villages in the State. It is only necessary to test them to see if they are correctly graduated. To do this, place both in water containing melting ice or snow, and after remaining some time, see if the mercury in the tube stands exactly at 32° or freezing point, and see if both thermometers *exactly agree* in this respect. If they agree in regard to the freezing point, put them in a vessel of *hot water* and let them stand for a short time and then ascertain if they both mark the same temperature. If they do they may be used for taking observations. The more exact way would be to ascertain the boiling point, but this requires so many precautions and corrections that few could perform it correctly without apparatus such as few possess, except the makers of philosophical instruments.

Having ascertained that your thermometers are perfectly correct in regard to freezing points, and that they agree in measuring temperatures approaching the boiling point, fasten around the bulb of one thermometer, with needle and thread, a covering of thin muslin, and call this your "wet bulb" thermometer. Wet your muslin covering with pure soft water a short time before each observation—if in freezing weather it should be an hour before taking the observation—and hang up both thermometers in some place where neither the heat of the house nor the rays of the sun shall strike upon them, and you are ready for taking observations in regard to temperature and moisture of the atmosphere.

A "rain-gauge" that will answer a very good purpose may be easily constructed. Get a tinman to make you a round tin can about seven inches in diameter and six or seven deep. Make it perfectly round and exactly of the same diameter at top and bottom; let the upper edge be sharp and straight so that the rain-drops will not spatter off. Insert a small tube in the side, about four inches from the bottom, to pour out the water into your measuring-dish. Paint your rain-gauge outside and inside to prevent rusting. For a measuring-dish you can use the graduated measure employed by the druggist to measure fluid ounces. To graduate your rain-gauge, place it on some level surface and pour in enough water to fill it to the depth of one inch, exactly; then very carefully measure the water to ascertain how many fluid ounces are contained in one inch depth of your rain-gauge. Suppose one inch depth contains just 25 fluid ounces: then to measure the rain-fall you have only to ascertain how many fluid ounces fell in your rain-gauge, and divide this by 25, and you have the depth of your rainfall in inches; or multiply the number of fluid ounces by four, and you have the rainfall in hundredths of an inch.

Any man can construct a wind-vane that will answer his purpose very well. By application to Hon. I. Newton, Commissioner of Agriculture, at Washington, D. C., blanks will be furnished, with instructions for their use.

Thus it will be seen that the means of making very satisfactory meteorological observations may be obtained at trifling expense; and if observations even with such instruments should be made at such points as New Buffalo, Grand Haven, Grand Rapids, Kalamazoo, Grand Traverse, Alpena, Bay City, Saginaw, Port Huron, and Ann Arbor, as well as Monroe and Lansing, much might be done towards placing the meteorology of the Lower Peninsula on a scientific basis, by collecting and comparing such reports. From observations thus made, and from the results published for the information of all, or preserved as a basis for future comparison, great good might be secured to our State.

Who does not now wish that such observations had been taken thirty years since, that we might now use them for settling questions of vital importance to the agriculture of Michigan? For example, thirty years ago the peach was one of the most abundant fruits in this State; easy to cultivate, and the tree bearing early, it was planted everywhere, and everywhere yielded its luscious harvest. This was emphatically true of the south-eastern part of the State. At that time a frost injurious to corn at any time from May to October was a thing unknown. Thirty years ago I plucked in abundance spring flowers (*Erigenia*) in the open fields in Lenawee county, in January. Now the peach in all that region is a most uncertain crop. The contingency of frost enters into the farmer's calculations concerning the corn-crop, and curious boys do not hunt the fields for flowers in January. Fourteen years ago I settled in Eaton county, and there I again found the peach in all its pride of honey and gold; but there, too, it is fast passing away, till a good crop of peaches comes "like angels' visits." A similar change is observed in almost all of the older-settled parts of the State, till the peach seems destined to take up its final abode in a narrow strip skirting the Eastern shore of Lake Michigan.

How shall we account for this? Is it the result of cosmical changes, or have we by the wasteful destruction of our forests, thus opening our fields and orchards to the sweep of that terrible scourge, the southwest wind, brought this doom upon ourselves and our posterity? How important for this State if this question could be settled now, before further evil is wrought, and how valuable any meteorological records of those years long past, which could help us to solve this problem! Shall we longer delay some effort to remedy the negligence and carelessness of the past?

THE WINDS OF CENTRAL MICHIGAN.

From a careful examination of the meteorological records for nearly three years, taken at the State Agricultural College, I find that the wind has blown from N. E. and E. 533 times; from S. E. and S. 334 times; from S. W. and W. 1,452 times, and from N. W. and N. 309 times; or, in every 100 winds 11¾ blew from N. W. and N. 20¼ from N. E. and E. 12¾ from S. E. and S., and 55¼ from S. W. and W. It thus appears that much more than one-half of all our winds come from S. W. and W., and very nearly one-half come from S. W. alone. If this were uniformly a warm and genial wind, its influence would be welcomed by the farmer.

COLD WINDS.

Not only is the south-west our most prevalent wind, but during the cold season it is also our coldest wind. Thus for the two years past, the Register Thermometer has indicated a temperature at or below zero thirty-five times, viz.: with wind from N. E. two times, with an average temperature of 5½° below zero; from N. two times, with average temperature of 6° below zero; from W. four times, with an average temperature of 5¾° below zero; from N. W. five times, with an average temperature of 9° below zero; from the S. W. twenty-two times, with an average temperature of 10° below zero. Thus nearly two-thirds of our intensely cold periods are accompanied or preceded by a S. W. wind, and the temperature reached in these cold periods, is lower with this wind than with any other. Nor is its influence so uniformly good during the warm season. Few farmers at the West have forgotten the disastrous frosts of August and September, 1863, by which the corn-crop of all the North-west was so injured. Yet both these frosts were preceded for some 15 hours by a S. W. wind, moving with a velocity of twenty-five miles per hour.

Who has forgotten the terrible "wave of cold" which, about the 1st of January, 1864, swept the whole country lying east of the Rocky Mountains and north of 35°? The frosts of August and September, marking out in advance almost the exact path of this desolating force, seem to have been the videttes—the outriders—of the boreal host rushing to their arctic home. All this terrible "cold storm" swept over us with the S. W. wind blowing with the velocity of fifty miles per hour. So distinct was its sweep from the S. W., that while Missouri and Iowa were quailing under the touch of its icy breath, New England was in quiet: while the thermometer at Fort Snelling was 50° below zero, at the same hour in Boston it was 55° above zero, or a difference of 105° between Minnesota and Massachusetts! Yet in a few hours the storm, modified in temperature, reached New England, as it swept on to the North-east.

Happily such storms are rare, and we hope never to see its like again, but it may serve to show us the terrible possibilities that lurk in this fierce S. W. anti-trade, especially if, by the wanton destruction of our forests, we lay ourselves open still more to its merciless force.

Farmers at the West now recognize the importance of timber-belts to protect their flocks and orchards from the injurious effects of the cold winds. A question of first importance is, how shall such belts be placed most effectually to procure such protection? The answer may be different for different localities. I can only answer for the central portion of the State; but the facts I have presented in regard to the relative frequency of winds for central Michigan, and especially the fact that from the S. W. come most of our cold storms, plainly indicate the desirableness of preserving every barrier which will obstruct this wind, or mitigate its force, and especially to so arrange our timber-belts, that our orchards, barns and houses may be thereby thoroughly protected on the S. W.

The protecting influence of a large body of open water was well shown, in the fact that during this storm, the thermometer at Grand Haven stood 20° higher than at Milwaukee.*

RAINY WINDS.

While the westerly winds constitute 67 per cent. of the whole, they are not the winds which bring to us our main supply of rain. Leaving out of account the north and south winds, which are usually dry, and calling the winds from S. W. and N. W. the westerly winds, and those from N. E., E. and S. E., easterly winds, we find that much the greatest amount of rainfall is accompanied by easterly winds. Thus in 1863, easterly winds brought 11.685 inches of rain, and westerly winds 6.417 inches. In 1864 the easterly winds brought 20.51 inches, and westerly winds 9.77 inches. In 1865 the easterly winds brought 18.104 inches and westerly winds

---

*In this connection it may be well to note, that the Grand Haven correspondent of the *Detroit Advertiser and Tribune*, stated that during the cold *term* of February 14th to 17th, 1866, the mercury at no time fell below zero, at Grand Haven, while at the State Agricultural College, according to Dr. Kedzie's record, it was 24° below zero on the morning of the 16th. Illinois and Wisconsin papers reported quite as great a degree of cold for various localities in those States. S. H.

9.034 inches. This is just twice the rainfall with easterly winds that there is with the westerly winds, for three years past.

When we compare the amount of rainfall with the number of observations in which the wind has blown from these opposing points, the result becomes more striking. Thus to give us one inch depth of rainfall in 1863, the wind was easterly 11.2 times, while we received but one inch of rain with 70.1 westerly winds. In 1864, one inch of rain fell for every 12 easterly winds, and the same amount of rain for every 66½ westerly winds. In 1865, 14½ easterly winds gave an inch rainfall, and 60½ westerly winds gave but one inch. Or to give the average in round numbers, every twelve easterly winds gives us an inch rainfall, and every 65 westerly winds gives us the same depth of rain.

When I speak of the number of winds, it will be understood I speak of the number of observations taken three times a day, in which the wind is recorded as blowing from a given quarter.

It is evident from the foregoing that at this point the easterly is eminently our rainy wind. Indeed, I find but one record of a very heavy rain with a westerly wind, and that was June 29th and 30th, 1864, and perhaps this was really no exception, for it was preceded by an easterly wind for forty-eight hours.

I do not claim that the same ratio of winds and rain will be observed in all parts of our State. Doubtless the controlling influence of the great lakes may modify if not reverse the ratio observed at this point. Thus up to this time (Jan. 8th) we have had no sleighing worth the name, while fifty miles west of here and thence to the lake, there has been excellent sleighing. Such differences between these two sections are quite frequent. The westerly winds sweeping over Lake Michigan during the winter months, doubtless contribute largely to the snowfall on our western border. It would be interesting to know if the rainfall is similarly affected by the same agency.*

EVAPORATION AND RAINFALL.

The moisture of the atmosphere is usually measured by means of observations taken three times a day. If we could have continuous observations, *i. e.* taken every moment of day and night, the results reached would probably be more satisfactory. As an approximation in this direction, I determined to ascertain the relations of evaporation and rainfall during the growing season. For this purpose I procured a tin dish with the same diameter at top and bottom, in order that the evaporating surface, and the surface receiving the rainfall might be equal. On the 15th of March, I placed water to the depth of one inch in this dish, and sunk the dish in an open piece of ground, away from trees and buildings, to the depth of one inch, so that the surface of the water should be at the same level as that of the ground. Up to April 1st there had .37 inch rain, but the dish was nearly dry, and I added one inch more of water to the dish. April 14th there had been .328 inch rain-fall, but the dish was again dry, and another inch was added. May 31st there had been .594 inch

---

*Since writing the above I have received a copy of the *Grand Traverse Herald*, for January 26th, 1866, containing an article on the meteorology of the Grand Traverse region, by Geo. E. Steele, of Homestead, Benzie county. From this article I make the following extract:

"The direction of the wind has much to do in modifying our climate, and a record has been kept of its direction and force since April 6th. Of the 810 observations taken, the wind was south-west 190; west 110; north-west 195; north 80; north-east 45; east 26; south-east 36; south 23; none 105. From which we learn that its prevailing direction has been from Lake Michigan, at the south-west, west and north-west points; and the record shews almost without exception, that when the wind has changed to one of these points, especially south-west, the change has been attended by a rise of the mercury, This influence of Lake Michigan was very decided in September, when the west and south-west directions exceeded all others combined. The place of observation is eight miles in a north-west and fifteen miles in a south west direction from the Lake, and at those places in nearer proximity to Lake Michigan and Grand Traverse Bay, their influence is still more decided."

Some of these results indicate a meteorological condition so diverse from that of the central part of the State that I am more than ever anxious for the means of comparison of the meteorology of different sections of the State, as stated in the body of this article.

rain, and the dish was dry and another inch was added. June 4th, no rain, dish dry, and another inch of water was added. June 30th there had been 3.552 inches rain, and the dish was dry and another inch of water was added. From this date to November 15th, there was a rainfall of 15.237 inches, and the dish was not dry in all that time. On the 14th of November the dish contained ½ inch of water. The frost destroyed the dish at that time, and the experiment was discontinued for the season.

The result reached by this experiment is, that while the rainfall for the eight months from March 15th to November 14th, was 24.353 inches, yet the evaporation from a saturated surface at the level of the ground exceeded the rainfall by 6½ inches, or a total evaporation of 30.853 inches in eight months.

This experiment could be easily repeated in different parts of the State, and the comparison of the results would be interesting.

STATE AGRICULTURAL COLLEGE,
January, 1866.

[The subject of shelter by natural or artificial plantations of trees, spoken of by Dr. Kedzie in the foregoing valuable essay, is one of great importance to the farmers of this State. Dr. K.'s remarks suggest the advantage of leaving wood and timber-lots in proper positions in reference to the cultivated portion of the farm—or especially in reference to sites designed for fruit-trees—when forest-lands are cleared. It is believed that this subject has been too much overlooked, and that in the older-settled portions of the State much injury has already resulted from opening the country to the sweep of cold winds. The rapid destruction of the original forest will soon render it necessary to leave land to produce a new growth of trees for fuel and timber, and the object of protection should be kept prominently in view in assigning tracts for this purpose. As affording further evidence of the advantages of protection, an extract is appended from a valuable lecture on fruit-culture, by T. T. Lyon, Esq., of Plymouth, delivered at a late meeting of the agriculturists of Michigan, at Jackson. —S. H.]

In connection with the subject of aspect, I cannot refrain from urging strongly the necessity of shelter. Were I addressing the agriculturists of the western prairies, it would hardly be necessary to do more than to merely call attention to the subject, to have it feelingly appreciated. But in the forests of our State, we have hardly yet outgrown the once prevalent feeling among our pioneers, that our timber is a nuisance, to be got rid of in the most rapid and complete manner possible. The consequence is, that immense stretches of timber have been literally swept away, leaving scarcely a tree, or even a bush behind; while the reserved timber has generally been left at the rear of farms, in as compact a form as possible, the better to guard against its injury by high winds.

The natural result of this wholesale destruction is manifesting itself in the higher winds, the more sudden changes, and the more extreme cold of our winters. Although, in consequence of this state of affairs, the peach, once almost as sure throughout our State as the apple, is now, in effect, driven under the lee of Lake Michigan; and although even our staple grain-crop—wheat—was, but two years since, almost a total failure, from want of shelter and protection, and though we have reason to fear that we have not yet seen the worst, the process of destruction yet goes on unchecked, and with a strange fatuity. Although the subject is one which deeply concerns us all, no measures are being taken, or even seriously contemplated, to stay the growing calamity.

Two years since, at a similar gathering, I availed myself of the opportunity to urge upon the agriculturists of the State the importance of action in this matter. During the next winter, the wheat crop of the entire State, from the want of the usual covering of snow, and the general lack of shelter from wind and sun, was diminished in amount more than one-half—a loss to the State, in a single year, of more than five millions of bushels. The present winter threatens a repetition of this same calamity; and, with the great breadth of wheat sown, we shall be fortunate if the amount of loss be not essentially greater than before.

The remedy for this state of affairs is obvious; and was briefly stated on the occasion alluded to, viz: the leaving of belts of timber along the west and north sides of each farm, and even intermediate ones, if the farm be large; and where it is already too late for this, the supplying of the deficiency, by the planting of rapid-growing trees for that purpose, interspersed, if possible, with evergreens.

It is presumed that during the season alluded to, few of us failed to observe that even the protection of a ridge or "dead-furrow," running north and south through a field of wheat, was sufficient to preserve a streak of green, where all else was brown and bare; and that the shelter of a fence was the means of preserving a still greater breadth; while the interposition of a hedge of oak grubs, such as are but too common on our "opening" farms, or a body of timber, invariably secured the preservation of a fair crop, over a still greater breadth of ground, often amounting to an entire field.

To those who, during the last few years, have had experience in the management of orchards, we hardly need urge the importance of this subject, as they will readily understand that it applies in their case, with a force greater in proportion as an orchard is of more value than a field of wheat.

To all we therefore say, plant trees! plant them freely; about your houses—your barns—your gardens—your orchards—your highways—and your entire farms. Let our State, county and township agricultural societies offer premiums for wind-breaks, whether of natural or artificial origin; also for farms and even orchards and highways, with the best and most effectual systems of shelter for this purpose. Let laws be enacted by the State Legislature, encouraging townships, as soon as society is sufficiently advanced, to shut up their highways against stock of all kinds running at large, and to offer premiums for the planting of trees along their borders, and also to inflict penalties for the willful destruction or injury of those already there.

REGISTER OF

METEOROLOGICAL OBSERVATIONS,

FOR THE YEAR 1865,

TAKEN AT THE

State Agricultural College of Michigan,

BY R. C. KEDZIE,

Professor of Chemistry.

LATITUDE, 42° 42′ 24″; LONGITUDE, 7° 33′ 19″ WEST OF WASHINGTON.

Height above the Sea, 895 Feet.

ROLOGICAL OBSERVATIONS FOR THE MONTH OF FEBRUARY, 1865.

SNOW.		CLOUDS.						WINDS.						Max. Thermometer.	Min. Thermometer.	BAROMETER HEIGHT REDUCED TO FREEZING POINT.				FORCE OR VAPOR,
Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.				7 A. M.	2 P. M.	9 P. M.	Mean.	7 A. M.
		Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.							
......	....	100	Cu. st.	30	Cir.st.	10	St.	N	1	N W	1	S W	1	36	12	29.266	29.251	29.272	29.263	.135
......	....	100	Cu. st.	80.	Cu. st	100	Cu. st	E	2	E	3	S E	4	36	20	19.289	29.171	29.068	29.172	.117
.36	....	100	Nim.	100	Nim.	100	Nim.	S E	5	S E	3	S W	3	40	29	28.799	28.645	28.597	28.680	.168
......	....	100	Cu. st.	100	Cu. st.	100	Cu. st.	W	5	W	4	W	5	37	14	28.863	28.994	29.005	28.954	.199
......	....	90	Cu. st.	100	Cu. st.	90	Cu.	N W	5	N W	4	N W	1	22	11	29.048	29.105	29.077	29.076	.075
......	....	100	Cu. st.	100	Cu. st.	100	Cu. st.	S W	2	S W	2	N W	1	26	12	29.071	29.002	28.986	29.019	.088
......	....	100	Cu. st.	100	Cu. st.	100	Cu. st.	N E	1	N E	2	N E	3	21	12	28.994	28.828	28.754	28.858	.082
.20	2	100	Nim.	100	Cu. st.	100	Cu. st.	N W	3	W	3	N W	4	22	6	28.713	28.729	28.701	28.721	.088
......	....	100	Cu. st.	30	Cu.	100	Cu.	W	1	W	3	S W	3	24	10	28.827	28.722	28.781	28.776	.065
......	....	100	Cu. st.	40	Cu.	100	Cu. st.	S W	2	W	3	N W	4	35	–8	28.677	28.717	28.892	28.762	.105
.10	1	70	Cu. st.	100	Cu. st.	100	Nim.	W	1	S W	2	S W	4	26	–5	29.983	28.867	28.681	28.843	.022
......	....	00	......	10	Cu.	10	St.	N W	2	N E	1	....	0	13	–17	29.222	29.327	27.377	29.303	.045
......	....	20	Cu. st.	30	Cu. st.	20	St.	S W	1	S W	2	S E	1	22	–10	29.373	29.357	29.214	29.314	.002
......	....	30	Cir.st.	70	Cir.st.	100	Cu. st.	S E	1	S E	1	E	2	39	9	29.090	28.926	28.874	28.963	.024
......	....	100	Cu. st.	100	Nim.	100	Nim.	E	3	E	3	E	2	38	18	28.660	28.512	28.456	28.542	.077
.40	4	100	Nim.	100	Cu. st.	100	Cu. st.	E	1	N	1	....	0	36	19	28.460	28.485	28.631	28.525	.129
......	....	100	Cu. st.	100	Cu. st	100	Cu. st.	E	2	N E	1	....	0	30	15	28.583	28.565	28.695	28.614	.118
......	....	90	Cu. st.	100	Cn. st.	50	Cu. st.	S W	1	W	2	W	1	35	17	28.780	28.835	28.900	28.838	.106
......	....	90	Cu.	70	Cu.	00	......	S W	1	W	2	....	0	40	–3	29.027	29.081	29.176	29.094	.117
......	....	40	Cir.st.	30	Cir.st.	30	Cir.st.	S E	1	E	2	S E	1	39	5	29.268	29.245	29.233	29.248	.045
......	....	90	Cir.st	70	Cir.st.	50	Cir.st.	S E	3	S E	3	S E	4	45	20	29.194	29.073	28.928	29.065	.082
.24	....	100	Nim.	10	Cu.	00	......	S W	4	S W	3	S W	2	43	24	28.894	28.965	29.043	28.967	.248
......	....	90	Cu.	30	Cir.st.	00	......	W	3	S W	3	S W	2	34	3	29.082	29.094	29.147	29.107	.123
......	....	00	......	10	St.	20	Cu.	E	1	S W	1	S E	1	36	7	29.212	29.141	29.101	29.151	.067
......	....	80	Cir.st.	100	Nim.	100	Nim.	E	1	E	3	S E	3	36	20	28.969	28.685	28.310	28.654	.117
.26	....	100	Nim.	100	Cu st.	100	Cu. st.	S W	4	W	4	W	4	38	22	28.375	28.710	29.017	28.767	.229
.20	2½	100	Cu. st.	100	Cu. st.	100	Nim.	N E	1	E	2	S E	3	30	17	29.223	29.242	29.151	29.205	.129
......	....	90	Cu. st.	100	Cu. st.	100	Cu. st.	N	1	S W	1	....	0	40	18	29.077	29.038	29.190	29.101	.111
1.76	9½	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......	......
......	....	81.4	......	71.7	......	70.7	......	....	..	....	..	....	..	32°.64	10.°60	......	......	......	28.949	.1034
....		74.6						....						....		.1176				.1

ETEOROLOGICAL OBSERVATIONS FOR THE MONTH OF JANUARY, 1865.

N AND SNOW.			CLOUDS.						WINDS.						Max. Thermometer.	Min. Thermometer.	BAROMETER HEIGHT REDUCED TO FREEZING POINT.			
			7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.							
rain or snow.	Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.			7 A. M.	2 P. M.	9 P. M.	Mean.
....	....	....	20	Cu. st.	90	Cu. st.	50	Cir. st.	S W	1	S W	2	S W	1	22	9	29.022	29.005	28.890	28.972
....	....	....	100	Cu. st.	20	Cu. st.	00	......	S W	1	N	1	....	0	25	–3	28.894	28.998	29.085	28.992
....	....	....	100	Cir. st.	80	Cu.	80	Cu.	E	1	S W	1	W	2	31	4	28.996	28.925	29.003	28.974
....	....	....	90	Cu.	90	Cir. st.	100	Cu. st.	N W	1	S W	1	S W	3	28	15	29.116	29.009	28.946	29.023
....	....	....	90	Cu. st.	50	Cu. st.	100	Cu. st.	S W	3	S W	4	W	4	39	25	28.741	28.757	28.746	28.748
....	....	....	100	Cu. st.	100	Cu. st.	70	Cir. st.	N E	2	N E	2	N E	2	28	9	28.828	28.800	28.770	28.799
....	....	....	100	Cu. st.	90	Cu.	10	St.	N W	2	N	2	E	1	23	2	28.967	29 085	29.175	29 075
....	....	....	90	Cu. st.	100	Cir st.	100	Cir. st.	E	3	S W	3	S W	3	30	13	29.129	28.994	28.936	29.019
....	....	....	90	Cu st.	90	Cu. st.	80	Cu. st.	S W	1	S W	1	S	1	37	20	28.987	28.962	28.972	28.973
2 M.	.10	1	100	Nim.	100	Cu. st.	30	Cu.	N	4	N	4	N W	2	24	–11	28.741	28.696	28.893	28.776
....	....	....	90	Cu. st.	90	Cu.	90	Cu. st.	S W	1	S W	3	S W	4	26	10	28.932	28.815	28.917	28.884
....	....	....	80	Cu. st.	30	Cu. st.	30	St.	S W	3	S W	3	S W	3	32	14	28.922	28.864	28.909	28.898
. M.	.05	½	90	Cu. st.	100	Cu. st.	100	Cu. st.	S E	1	S W	3	S W	2	38	16	28.844	28.743	28.688	28.758
....	....	....	100	Cu. st.	100	Cu. st.	100	Cu. st.	N W	2	W	3	S W	1	26	14	28.719	28.727	28.741	28.729
....	....	....	100	Cu. st.	100	Cu st.	50	St.	S W	1	W	2	W	2	27	–6	28.675	28.614	28.728	28.672
....	....	....	100	Cu. st.	50	Cu. st.	100	Nim.	N W	1	S W	3	W	1	20	–0	28.787	28.613	28.533	28.644
....	....	....	80	Cu. st.	100	Nim.	100	Nim.	N W	1	W	1	N	1	17	–1	28.504	28.504	28.731	28.579
....	....	....	80	Cu. st.	50	Str.	90	Cu. st.	S W	1	W	3	W	4	20	–6	28.833	28.883	29.319	29.011
....	....	....	60	Nim.	90	Cu st.	20	St.	S W	2	S W	1	S W	1	19	7	28.941	28.886	28.913	28.913
....	....	....	50	Cu. st.	40	Cu. st.	20	Cu.	S E	3	S E	5	S E	5	22	17	28.963	29.391	28.900	29.284
....	....	....	40	Cu st.	100	Nim.	100	Nim.	S E	2	S E	2	S E	1	29	19	28.736	28.708	28.705	28.716
. M.	.20	2	100	Nim.	100	Nim.	100	Cu. st.	S E	1	S W	2	W	2	37	19	28.661	28.582	28.682	28.641
....	....	....	100	Cu. st.	100	Cu. st.	100	Cu. st.	W	3	W	3	W	1	25	9	28.720	28.703	28.739	28.720
. M.	.20	2	100	Nim	70	Cu. st.	30	St.	S W	3	S W	4	S E	1	25	–5	28.729	28.712	28.685	28.703
....	....	....	100	Cu. st.	100	Cu. st.	100	Cu. st.	S W	3	S W	5	S W	4	12	–8	28.725	28.727	28.679	28.710
....	....	....	30	Cir st.	50	Cu.	100	Cu.	S W	3	S W	4	S W	2	9	–12	28.699	28 774	28.710	28.761
....	....	....	60	Cir. st.	80	Cu.	30	Cu.	S W	1	W	3	S W	2	14	–5	28.715	28.768	28.825	28.769
. M.	.10	1	100	Nim.	100	Cu. st.	100	Cu. st.	W	2	W	2	W	3	30	18	28.977	28.733	29.111	28.907
....	....	....	100	Cu st.	30	Cu.	00	......	W	1	N W	2	....	0	29	4	29.239	29.179	29.342	29.253
...	....	....	20	St.	40	Cir. st.	100	Cu. st.	S W	1	S W	2	S W	2	30	5	29.398	29.344	29.355	29.365
....	....	....	100	Cu. st.	100	Cu. st.	100	Cu. st.	S W	2	W	1	S W	1	36	23	29.230	29.236	29.243	29.236
....	.65	6½	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......
....	....	....	83.2	......	78.4	......	70.6	......	....	..	....	..	....	..	26°.13	6°.93	......	......	......	28.887
....			77.4						....						......	......	....			

METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF MARCH, 1865.

AND SNOW.			CLOUDS.						WINDS.								BAROMETER HEIGHT REDUCED TO FREEZING POINT.				FORC VA
			7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M								
	Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Max. Thermometer.	Min. Thermometer.	7 A. M.	2 P. M.	9 P. M.	Mean.	7 A. M.
...	....	....	100	Cu. st.	80	Cu. st.	100	Cu. st.	E	1	E	3	S E	4	36	22	29.227	29.130	29.052	29.136	.1
M.	.28	....	100	Nim.	70	Cu.	40	Cu.	S E	3	S W	4	W	2	47	14	28.683	28.750	28.927	28.786	.1
...	....	....	90	Cu. st.	40	Cir. st.	100	Cu. st.	S W	1	N	1	W	1	37	14	29.033	29.010	28.930	28.991	.1
...	....	....	100	Cu. st.	20	Cu.	20	St.	N W	3	N W	1	W	1	33	11	28.329	28.922	29.109	28.353	.1
...	....	....	100	Cu. st.	80	Cu.	90	Cir. cu	S E	3	S W	3	S W	1	34	12	29.149	29.075	29.029	29.087	.0
...	....	....	10	St.	30	Cir. cu	10	St.	S	1	S W	4	S E	2	46	15	29.076	28.937	28.865	28.976	.0
M.	.06	....	90	Nim.	70	Cu.	90	Cu.	S W	2	S W	5	W	4	55	9	28.663	28.573	28.867	28.701	.1
M.	.14	....	30	Cu. st.	100	Cu. st.	100	Nim.	N E	3	E	3	E	3	30	8	29.082	28.942	28.874	28.966	.0
...	....	....	100	Cu. st.	100	Cu. st.	50	Cu. st.	S W	2	W	2	W	5	33	0	28.581	28.824	28.712	28.672	.1
...	....	....	80	Cu. st.	100	Cu. st.	100	Cu. st.	S W	4	S W	4	W	1	20	3	28.860	28.936	28.896	28.230	.0
...	....	....	100	Cu. st.	40	Cu.	30	Cu.	W	1	W	5	W	4	23	4	28.829	29.995	28.996	28.940	.0
...	....	....	100	Cu. st.	30	Cir. st.	100	Cu. st.	E	2	S W	4	S E	2	34	7	29.104	28.849	28.756	28.903	.0
M.	.30	3	90	Cu. st.	100	Nim.	100	Nim.	N W	2	E	3	E	3	26	15	29.061	29.134	29.108	29.067	.1
M	.54	....	100	Nim.	100	Nim.	100	Nim.	E	1	S E	3	S E	4	48	22	28.952	28.834	28.789	28.841	.1
...	....	....	100	Nim.	100	Nim.	100	Nim.	S W	1	....	0	S E	1	52	44	28.724	28.730	28.610	28.688	.3
M.	.60	....	100	Nim.	100	Cu. st.	40	Cu.	S E	1	S W	4	S W	5	49	15	28.320	28.493	28.595	28.469	.3
N.	.15	....	20	Cu. st.	100	Cu. st.	100	Cu. st.	S W	3	S W	3	S W	3	50	23	28.640	28.561	28.403	28.534	.1
...	....	....	60	Cu.	20	Cu.	00	......	W	4	W	4	....	0	41	19	29.020	29.139	29.126	29.095	.1
...	....	....	20	Cu. st	30	Cu. st.	40	Cu. st.	....	0	S E	2	S E	1	57	25	29.102	28.941	28.827	28.956	.1
...	....	....	80	Cu. st.	30	Cir. st.	80	Cu. st.	S W	1	S W	3	S E	3	72	48	28.789	28.743	28.601	28.677	.3
...	....	....	100	Cu. st.	100	Nim.	100	Nim.	S W	3	S W	2	S W	2	63	30	28.432	28.285	28 282	28 336	.4
M.	.72	....	100	Nim.	60	Cu. st.	00	......	S W	6	S W	6	W	5	47	25	28.367	28.366	28.496	28.409	.1
...	....	....	100	Cu. st.	30	Cu.	20	Cu. st	S W	3	W	5	N W	4	44	28	28.382	28.448	28.561	28.463	.1
...	....	....	100	Cu. st.	100	Cu. st.	100	Cu. st.	W	3	N W	4	W	3	40	25	28.565	28.679	28.679	28.641	.1
...	....	....	100	Cu. st.	80	Cu.	20	Cu. st.	N W	3	N W	3	N W	2	42	15	28.902	28.911	29.056	28.989	.1
...	....	....	00	......	30	Cir. st.	40	Cu. st.	N	1	N	1	E	1	44	20	29.234	29.271	29.230	29.211	.1
...	....	....	80	Cir. cu	70	Cir. cu	100	Cu. st.	E	1	E	2	....	0	59	29	29.209	29.094	29.022	29.108	.1
...	....	....	100	Cu. st.	40	Cir. st.	00	......	S E	2	S W	1	S W	3	64	31	28.975	28.926	28.896	28.925	.1
...	....	....	100	Cu. st.	100	Cu. st.	00	......	S E	1	S E	1	....	0	64	31	28.961	28.905	28.852	28.906	.2
...	....	....	60	Cu. st.	80	Cir. st.	20	Cir.	N E	3	N	3	N	2	56	22	28.835	28.737	28.661	28.744	.1
...	....	....	30	Cir. st.	20	Cir. st.	20	Cir.	S W	1	W	5	W	2	64	24	28.680	28.555	28.558	28.597	.1
...	2.79	3	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......	....
...	....	....	78.7	......	66.1	......	58.4	......	....	..	....	..	....	..	49°.87	19°.77	......	......	......	28.806	.1
....	....	....	67.7						....						......	......	......				

TEOROLOGICAL OBSERVATIONS FOR THE MONTH OF APRIL, 1865.

D SNOW.		CLOUDS.						WINDS.								BAROMETER HEIGHT REDUCED TO FREEZING POINT.				FORCE O VAPOR
		7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.								
Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Max. Thermometer.	Min. Thermometer.	7 A. M.	2 P. M.	9 P. M.	Mean.	7 A. M.
....	....	10	Cu. st.	10	Cu.	00	......	W	1	W	4	W	1	51	18	28.744	28.883	28.941	28.856	.129
....	....	10	St.	20	St.	20	St.	N W	1	W	2	....	0	57	25	28.921	29.023	28.994	28.979	.142
....	....	100	Cu. st.	80	Cu. st.	30	Cir. st.	S E	1	E	3	S E	3	60	36	28.988	28.858	28.918	28.921	.195
....	....	100	Cu. st.	100	Cu. st.	00	......	S E	3	S E	3	S E	1	70	49	28.873	28.849	28.849	28.857	.247
.026	....	80	Cu. st.	50	Cu.	100	Cu.	S E	1	S	3	S W	3	70	52	28.849	28.749	28.738	28.778	.411
....	....	100	Cu.	10	Cu.	20	Cu.	S	3	W	4	S W	4	63	28	28.534	28.026	28.712	28.424	.442
.014	....	100	Cu.	100	Cu.	90	Cu.	W	4	W	4	W	3	38	20	28.950	28.965	29.112	29.009	.118
....	....	60	Cu.	20	Cu.	00	......	W	3	S W	2	S W	1	36	20	28.991	29.269	29.253	29.171	.129
.054	....	40	Cir. cu	100	Cir. cu	100	Cu.	N E	1	E	1	S	1	54	28	29.251	29.184	29.178	29.204	.153
....	1	100	Cu.	70	Cu.	100	Cir. st.	N E	1	E	1	S W	1	51	33	29.022	28.966	28.975	28.987	.183
....	....	100	Nim.	100	Nim.	100	Nim.	E	1	S E	1	S	1	54	31	28.940	28.815	28.537	28.764	.216
.234	....	100	Cu.	100	Cu.	50	Cu. st.	S W	5	S W	4	S W	1	47	27	28.289	28.597	28.676	28.520	.228
....	....	10	Cu. st.	50	Cu.	00	......	....	0	W	3	S W	1	62	32	28.887	28.879	28.967	28.911	.178
....	....	20	Cu. st.	50	Cu.	100	Cir. cu	S W	2	W	3	....	0	64	33	29.025	28.984	28.994	29.001	.215
....	....	100	Cu:	100	Cu.	50	Cu. st.	W	1	W	2	W	1	60	26	28.820	28.694	28.679	28.731	.258
....	....	100	Cu. st.	30	Cir.	10	St.	W	5	W	2	....	0	60	24	28.878	28.980	29.121	28.993	.167
....	....	100	Cir. st.	100	Cir. cu	100	Cir. cu	S	1	S	2	S E	3	65	38	29.026	28.862	28.675	28.854	.173
.124	....	20	Cu.	10	Cu.	10	Cu.	W	4	W	4	....	0	61	37	28.621	28.758	28.878	28.739	.223
.374	....	100	Cu. st.	100	Nim.	100	Cu.	....	0	E	3	E	3	51	42	28.967	28.942	28.829	28.912	.228
....	....	10	Cu. st.	100	Cu.	100	Nim.	E	1	S	1	....	0	72	54	28.723	28.705	28.782	28.736	.322
.846	....	100	Nim.	100	Cu.	100	Nim.	N E	1	S W	3	W	4	70	35	28.477	28.593	28.545	28.538	.466
....	....	100	Nim.	100	Nim.	100	Nim.	S W	4	S W	4	S W	3	43	24	28.571	28.593	28.764	28.642	.186
....	....	60	Cir. st.	70	Cu.	10	St.	S W	1	W	3	S W	1	49	26	28.818	28.815	28.869	28.834	.150
....	....	00	......	00	......	00	......	....	0	W	3	W	1	78	40	28.983	28.978	28.961	28.974	.216
....	....	50	Cir. st.	10	Cu.	00	......	S W	2	W	4	S W	1	70	54	29.059	28.988	28.988	29.013	.336
....	....	100	Cir. cu	50	Cir. cu	100	Cu.	S W	3	W	4	S E	1	71	42	28.857	28.798	28.847	28.867	.338
....	....	100	Cu.	100	Cu.	100	Cu.	E	3	E	3	E	3	52	36	28.885	28.778	28.888	28.848	.169
....	....	100	Nim.	100	Nim.	100	Nim.	N E	2	N E	1	....	0	45	38	28.911	28.891	28.739	28.848	.238
.648	....	100	Nim.	100	Nim.	50.	Cu.	W	3	W	3	....	0	52	31	28.588	28.701	28.863	28.714	.254
....	....	100	Cu.	100	Cu.	100	Cu.	....	0	N E	1	N E	1	52	32	28.882	28.858	28.797	28.845	.267
2.32	1	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......	......
....	....	72.3	......	67.6	......	58	......	....	..	...	..	.....	..	54 83	33.36	......	......	......	28.815	.232
....		65.9						....						....						

ETEOROLOGICAL OBSERVATIONS FOR THE MONTH OF MAY, 1865.

D SNOW.		CLOUDS.						WINDS.								BAROMETER HEIGHT REDUCED TO FREEZING POINT.				FORCE O VAPO
		7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.								
Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Max. Thermometer.	Min. Thermometer.	7 A. M.	2 P. M.	9 P. M.	Mean.	7 A. M.
....	....	00	......	50	Cu.	20	St.	N	1	S W	3	W	1	55	33	28.848	28.859	28.828	28.845	.152
.192	....	100	Nim.	100	Nim.	00	......	....	0	E	1	....	0	53	28	28.858	28.919	28.946	28.907	.244
....	....	0	......	40	Cir. cu	80	Cir. cu	S W	1	S E	2	S W	1	62	36	29.053	29.001	28.932	28.995	.275
....	....	100	Cu. st.	80	Cir. cu	10	Cu.	S W	2	S	2	....	0	72	47	28.787	28.663	28.603	28.681	.295
....	....	20	Cir. st.	50	Cir. cu	60	Cir. cu	W	2	N	2	N E	3	78	45	28.598	28.665	28.663	28.642	.491
.524	....	100	Nim.	100	Nim.	100	Nim.	N E	3	N	2	W	2	48	40	28.720	28.768	28.838	28.774	.335
....	....	50	Cir. st.	20	Cu.	50	Cir. st.	S W	1	S W	3	S W	1	65	48	28.843	28.678	28.603	28.708	.285
....	....	80	Cir. cu	100	Cir. cu	100	Cu.	W	2	N W	2	N W	1	65	38	28.530	28.563	28.582	28.558	.378
....	....	10	Cu.	50	Cu.	100	Cu.	N E	3	E	2	N E	1	59	40	28.748	28.778	28.751	28.759	.199
....	....	100	Cir. cu	100	Nim.	100	Cir. cu	S	2	N	3	N	1	62	30	28.701	28.723	28.833	28.752	.334
....	....	90	Cir. cu	60	Cir. eu	00	......	N E	1	N	3	...	0	51	27	28.980	28.959	28.921	28.950	.110
....	....	10	Cir. cu	100	Cir. cu	100	Cu.	S	2	S W	3	S	1	69	39	28.870	28.870	28.743	28 829	.247
....	....	00	......	50	Cir. st.	100	Cu.	N	2	E	1	N E	3	62	40	28.883	28 906	28.891	28.860	.209
.216	....	100	Nim.	100	Nim.	100	Nim.	N E	1	N E	2	E	1	52	41	28.987	29.003	29 035	29.008	.267
....	....	100	Nim.	20	Cir. cu	20	Cir.	E	1	S E	2	S	3	77	51	29.127	29.073	29.021	29 073	.361
....	....	30	Cir. st	10	Cir. cu	20	Cu.	S W	3	S W	3	S W	3	83	63	28.997	28.397	28.848	28 927	.586
.246	....	100	Cu.	100	Nim.	100	Nim.	S W	1	S W	1	W	3	73	44	28 812	28.770	28.741	28 774	.662
....	....	100	Nim.	100	Nim.	100	Nim.	N E	2	N E	2	N E	2	61	48	28.778	28.796	28.752	28.775	.361
....	....	100	Nim.	100	Cu.	10	St.	E	1	S	1	....	0	75	50	28.754	28.724	28.713	28.730	.449
....	....	80	Cu.	70	Cir. cu	00	......	W	1	S W	2	S	1	79	59	28.730	28 693	28.610	28 677	.549
....	....	90	Cu.	70	Cu.	00	......	S	2	S W	3	W	1	75	51	28.436	28.446	28.478	28.454	.695
....	....	90	Cu.	10	Cu.	00	......	W	3	W	3	....	0	69	32	28 554	28.625	28.681	28.620	.380
....	....	00	......	10	Cu.	60	Cu.	S W	1	W	2	W	1	69	49	28.846	28.811	28.765	28 807	.321
.594	....	100	Nim.	100	Nim.	100	Nim.	N E	1	S E	2	N W	1	55	44	28 738	28.690	28.723	28.717	.334
....	....	100	Cir. cu	100	Cu.	70	Cu.	N E	2	N E	3	N E	2	64	44	28.823	28.837	28.841	28.833	.341
....	....	70	Cu.	60	Cu.	00	......	N E	2	N	3	N W	1	65	34	28.877	28.881	28.856	28.871	.269
....	....	00	......	30	Cir.	00	......	N	1	N E	3	....	0	77	42	28 873	28.837	28.848	28.852	.321
....	....	10	Cu.	10	Cir.	00	......	S W	1	N E	3	....	0	59	38	28.727	28.703	28.743	28 724	.362
....	....	00	......	00	......	Haze.	......	N E	1	N E	3	....	0	82	38	28.838	28 886	28.930	28.884	.352
....	....	00	......	00	......	00	......	S W	1	W	2	....	0	30	46	29.030	29 043	29 043	29 035	.383
....	....	Haze.	......	00	......	00	......	W	1	S W	3	....	0	84	49	29.026	28.986	28.980	28 927	.422
1.772	....	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......	......
....	....	58.7	......	57.8	......	45.4	......	.	..	....	..	....	..	66°.77	42°38	......	......	......	28 807	.353
....				53.9				....						......	......	....				

ETEOROLOGICAL OBSERVATIONS FOR THE MONTH OF JUNE, 1865.

ND SNOW.		CLOUDS.						WINDS.						Max. Thermometer.	Min. Thermometer.	BAROMETER HEIGHT REDUCED TO FREEZING POINT.				FORCE VAPO
		7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.								
Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.			7 A. M.	2 P. M.	9 P. M.	Mean.	7 A. M.
....	....	00	......	00	......	00	......	W	1	S W	3	S W	1	85	55	29.001	28.938	28.925	28.988	.478
....	....	40	Cir.cu	10	Cir.cu	00	......	S W	3	S W	3	....	0	86	60	28.921	28.885	28.874	28 926	.595
....	....	00	......	00	......	10	Cir.st.	S W	3	S W	3	....	0	87	61	28.913	28.872	28.877	28.920	.666
....	....	10	Cir.cu	30	Cu.	30	St.	S W	2	S W	3	....	0	88	59	28.915	28.885	28.876	28.892	.680
....	....	40	Cir.	90	Cir.cu	80	Cir.cu	S W	1	S W	2	....	0	90	63	28.955	28.957	28.966	28.959	.731
.61	....	00	......	80	Cu.	00	......	S W	2	S W	3	....	0	90	70	28.949	28.947	28.947	28.947	.772
....	....	30	Cir.cu	90	Cu. st.	30	Cir.cu	....	0	W	3	....	0	82	53	28.943	28.943	28.973	28.953	.706
....	....	70	Cir.cu	90	Cu. st.	100	Cir.cu	N E	3	N E	2	....	0	75	59	29.066	29.023	28.988	29.025	.439
.26	....	100	Cu. st.	100	Cir.cu	100	Nim.	E	2	S W	1	....	0	78	54	28.963	28.883	28.805	28.883	.497
....	....	60	Cir.cu	30	Cu.	00	......	N E	2	W	1	....	0	71	46	28.891	28.952	28.962	28.969	.456
....	....	00	......	20	Cu.	00	......	S	1	S W	2	....	0	82	49	28.929	28.923	28.868	28.906	.543
....	....	30	Cu. st.	30	Cu.	30	Cu.	W	2	W	2	W	1	85	55	28.861	28.816	28.817	28.831	.564
....	....	100	Cir.cu	90	Cir.st.	100	Nim.	N E	2	E	2	N. E	2	79	57	28.858	28.867	28.845	28.856	.473
....	....	100	Nim.	100	Nim.	100	Nim.	S E	1	S E	2	S E	2	73	58	28.885	28.870	28.780	28.811	.523
1.39	....	100	Cu.	90	Cu.	100	Cu.	S	2	S	2	S	2	83	60	28.788	28.756	28.777	28.773	.720
....	....	90	Cu.	100	Cu.	20	Cir.cu	S W	2	S W	2	S	1	85	68	28.832	28.847	28.854	28.844	.705
....	....	10	Cu.	20	Cu.	10	Cu. st.	S	2	S	2	....	0	91	67	28.917	28.922	28.911	28.916	.870
.22	....	00	......	60	Cu.	100	Nim.	S	2	S E	3	S E	1	90	56	28 944	28.908	28.906	28.919	.846
... ...	....	50	Cir.st.	50	Cu.	10	Cu.	N W	2	W	2	....	0	79	52	28.969	28.927	28.910	28.935	.478
.146	....	00	......	90	Cu.	100	Cu.	S W	2	S W	4	....	0	81	46	28.939	28.875	28.862	28.892	.543
....	....	10	Cir.cu	80	Cu.	00	......	S W	1	S W	3	S W	1	73	42	28.919	28.918	28.891	28.909	.460
....	....	10	Cu.	10	Cu. st.	00	......	N	1	N W	1	....	0	77	51	28.859	28 934	28.969	28.934	.378
....	....	100	Cu.	90	Cir.cu	40	Cu. st.	N	1	S	2	S	1	83	63	28.984	28.971	28.946	28 937	.549
....	....	90	Cir.cu	100	Cir.st.	100	Nim.	S W	2	S	2	S W	1	83	64	28.926	28.879	28.823	28.876	.772
.806	....	100	Nim.	100	Nim.	100	Nim.	S W	1	S W	2	S W	1	81	53	28.774	28.636	28.660	28.69	.733
....	....	100	Cu.	100	Cu.	90	Cu.	S W	3	W	3	W	2	59	42	28.601	28.613	28.665	28.626	.394
....	....	10	St.	30	Cu.	10	St.	S W	2	W	3	....	0	71	48	28.774	28.798	28.858	28.810	.391
.18	....	100	Cu.	100	Cu.	20	Cu. st.	S	2	S W	3	S	2	76	58	28 847	28.714	28.690	28.750	.478
.04	....	80	Cir.st.	100	Cu.	90	Cir. cu	S	3	S	2	S W	1	79	60	28.555	28 567	28.603	28 575	.81
....	....	100	Cir.st.	90	Cu.	40	Cir. st.	S W	2	S W	2	S	1	76	58	28.755	28.769	28.803	28.775	.67
3.552	....	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......	......
....	....	51	......	65.6	......	47	......	...	..	....	..	....	..	80 6°	°56 2	......	......	......	28.868	.59
....		54.5						....						....	....	....				

METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF JULY, 1865.

AND SNOW.			CLOUDS.						WINDS.						Max. Thermometer.	Min. Thermometer.	BAROMETER HEIGHT REDUCED TO FREEZING POINT.				FORC VA
			7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.								
	Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.			7 A. M.	2 P. M.	9 P. M.	Mean.	7 A. M.
M.	.082	....	100	Nim.	80	Cu.	20	Cir. cu	W	1	S W	3	S W	1	75	52	28.793	28.730	28.716	28.746	.59
..	....	....	20	Cu.	10	Cir.	10	Cu.	W	3	W	3	....	0	73	51	28.807	28.848	28.863	28.839	.51
..	....	....	100	Cu. st.	90	Cir. cu	10	Cir. cu	S W	1	S W	3	....	0	81	59	28.889	28.862	28.880	28.877	.51
..	....	....	100	Cu.	100	Cu.	100	Cir. cu	....	0	S	1	....	0	82	58	28.926	28.917	28.910	28.917	.66
M.	.526	....	100	Nim.	90	Cir. cu	100	Cu.	N E	1	N E	2	S E	2	77	60	28.971	29.000	28.983	28.951	.55
..	....	....	20	Cir. cu	40	Cu.	00	......	S W	1	S W	3	S W	2	87	70	28.951	28.882	28.893	28.908	.73
..	....	....	100	Cu.	60	Cir. cu	20	Cir. st.	S W	1	S W	2	N E	2	84	59	28.916	28.910	28.904	28.910	.78
M.	.48	....	100	Nim.	100	Nim.	Haze.	......	N E	1	N E	2	....	0	71	54	28.928	28.928	28.891	28.915	.54
..	....	....	100	Cir. st.	100	Cir. st.	100	Cu. st.	N E	2	N E	2	N E	1	70	54	28.992	28.991	28.991	28.991	.46
M.	.11	....	100	Nim.	100	Nim.	100	Nim.	N E	1	N E	1	N E	1	64	53	29.000	28.994	28.854	28.949	.42
..	....	....	50	Cir. cu	00	......	00	......	N W	1	N	1	....	0	80	51	28.963	28.956	28.829	28.916	.51
..	....	....	90	Cir. cu	90	Cu.	10	St.	N E	2	S W	3	S W	3	81	42	28.842	28.766	28.908	28.838	.39
..	....	....	80	Cir. cu	90	Cu.	10	Cu.	N	2	W	3	N	2	67	38	29.068	29.054	29.042	29.054	.33
..	....	....	10	Cir. st.	90	Cu.	100	Cu.	N	1	....	0	....	0	67	49	29.065	29.017	28.965	28.015	.30
..	....	....	100	Cu.	100	Cir. cu	100	Nim.	N E	1	E	2	....	0	67	52	28 953	28.905	28.890	28.919	.39
I.	.148	....	100	Nim.	100	Nim.	00	......	N E	2	N E	2	....	0	65	39	28.863	28.841	28.831	28 845	.40
..	....	....	00	......	30	Cu.	00	......	....	0	S W	2	S W	1	75	43	28.915	28.936	28.897	28.916	.39
..	....	....	00	......	60	Cu.	00	......	S W	2	S W	3	....	0	76	48	28.998	28.827	28.773	28.866	.42
I.	.088	....	100	Nim.	100	Nim.	00	......	S	1	....	0	....	0	75	51	28.639	28.562	28.631	28.610	.46
..	....	....	70	Cir. cu	100	Cu.	100	Cu.	S W	1	S W	1	....	0	76	59	28.776	28.798	28.853	28.809	.60
I.	1.222	....	100	Cu.	100	Nim.	100	Nim.	N E	2	N E	2	N E	2	70	53	28 942	28.894	28.891	28.909	.49
..	....	....	100	Nim.	100	Cn.	100	Cu.	N E	1	N E	1	....	0	74	58	29.034	29.071	29.056	29 053	.49
..	....	....	100	Cu.	100	Cir. cu	100	Cu.	....	0	S W	1	....	0	78	60	29.082	29.030	28 956	29.022	.5
..	....	....	100	Nim.	100	Cu.	100	Nim.	N E	1	N E	1	N E	1	77	61	28 947	8.900	28 825	28.890	.57
I.	1.250	....	90	Cir. cu	100	Cu.	10	Cu.	S	3	S W	4	S W	2	73	55	28.833	28.633	28.793	28.753	.68
..	....	....	70	Cir. cu	100	Cu.	10	Cu.	S W	2	S W	2	S W	1	77	59	28.853	28.849	28.860	28.854	.59
..	....	....	100	Cir. cu	100	Cu.	100	Cu.	S	0	S W	1	....	0	78	59	28.846	28.788	28.785	28.806	.57
..	....	....	100	Cu.	100	Cu.	100	Cir. st.	S W	1	W	2	....	0	77	50	28.810	28.802	28.820	28.810	.62
..	....	....	100	Cir. cu	40	Cu.	00	......	N E	2	N W	2	....	0	71	45	28.836	28.963	28.994	28.931	.452
..	....	....	10	St.	30	Cu.	00	......	N E	2	E	2	....	0	73	45	29.120	29.112	29.099	29.110	.391
..	....	....	00	......	10	Cu.	00	......	S W	1	S E	1	....	0	77	47	29.136	29.125	29.088	29.116	.469
.	3.906	....	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......	......
.	....	....	73.5	......	72.2	......	45.1	......	....	..	...	..	....	..	75°7	52°7	......	......	......	28.788	.483
......	......	......	63.6						......						......	......	......				

EOROLOGICAL OBSERVATIONS FOR THE MONTH OF AUGUST, 1865.

D SNOW.		CLOUDS.						WINDS.						Max. Thermometer.	Min. Thermometer.	BAROMETER HEIGHT REDUCED TO FREEZING POINT.				FORCE O VAPOR
		7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.								
Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.			7 A. M.	2 P. M.	9 P. M.	Mean.	7 A. M.
....	....	90	Cu.	100	Cu.	0	......	N E	1	S E	2	S	1	81	59	29.117	29.085	29.037	29.079	.487
....	....	20	Cir.st.	80	Cu.	8	Cir. cu	S	2	S W	3	S W	1	86	73	29.081	29.043	29.022	29.048	.745
....	....	50	Cir.st.	100	Cu.	10	Cu,	S W	1	....	0	....	0	81	61	29.035	29.036	29.007	29.026	.745
.668	....	100	Nim.	100	Nim.	10	Cir.st.	N E	1	N E	2	....	0	71	56	29.075	29.078	29.043	29.065	.576
....	....	80	Cir.st.	100	Cir.cu	10	Nim.	E	1	S E	2	S E	1	78	64	29.061	29.050	28.966	29.025	.648
.874	....	100	Cu.	100	Cu.	10	Cu.	S W	3	S W	3	W	3	76	51	28.878	28.682	28.738	28.766	.682
....	....	10	Cir.	30	Cir.cu	2	Cir.st.	W	3	S W	3	S W	1	72	56	28.826	28.848	28.850	28.841	.439
.554	....	100	Cu.	80	Cu.	1	Cu.	S W	2	S	2	....	0	75	57	28.886	28.886	28.891	28.887	.596
.490	....	90	Cir.cu	100	Cu.	10	Nim.	S E	1	S W	3	....	0	79	67	28.916	28.847	28.725	28.829	.671
....	....	90	Cu.	40	Cir.cu	1	Cir.	W	3	W	3	W	1	80	53	28.685	28.754	28.829	28.756	.726
....	....	100	Nim.	90	Cu.	0	......	N W	1	N	1	....	0	66	39	28.928	28.951	28.924	28.934	.449
....	....	10	St.	00	......	0	......	N	1	N E	1	....	0	70	42	28.968	28.954	28.932	28.951	.362
....	....	10	Cir.st.	40	Cir.cu	0	......	....	0	S W	1	....	0	75	44	28.975	28.945	28.937	28.952	.436
....	....	10	St.	10	Cir.cu	0	......	....	0	S W	1	....	0	76	52	28.967	28.952	28.891	28.936	.476
....	....	00	......	70	Cir.	1	St.	....	0	W	2	W	2	79	49	28.917	28.882	28.898	28.899	.505
....	....	100	Cu. st.	10	Cu.	0	......	N E	2	N E	2	N E	1	68	37	28.983	28.996	28.992	28.990	.362
....	....	00	......	00	......	0	......	E	1	S W	1	....	0	72	41	29.033	29 028	28.999	29.020	.436
....	....	20	Cir.st.	60	Cu.	9	Cu. st.	....	0	S W	1	....	0	77	55	29.007	28.995	28.988	28.996	.436
....	....	100	Cu.	60	Cu.	3	Cu.	....	0	S W	1	S W	2	81	61	28.984	28.947	28.896	28.942	.570
.040	....	90	Cu.st.	90	Cir.cu	10	Cu. st.	....	0	S W	3	....	0	78	64	28.860	28.795	28.770	28.811	.591
.210	....	100	Nim.	100	Nim.	10	Nim.	N E	1	N	1	N E	1	69	51	28.773	28.773	28.770	28.772	.226
....	....	100	Cu.	80	Cu.	0	......	N	3	N E	3	....	0	63	37	28.798	28.868	28.977	28.881	.405
....	....	00	......	100	Cu.	0	......	W	1	N	1	....	0	65	35	28.974	28.961	28.986	28.973	.309
....	....	00	......	10	Cu. st.	0	......	....	0	S W	1	....	0	68	38	29.125	29.106	29.073	29.101	.335
....	....	00	......	10	Cu.	0	......	....	0	S W	2	....	0	71	45	29.116	29.097	29.077	29.096	.390
....	....	10	St.	40	Cir.cu	1	Cu. st.	S W	1	S W	3	....	0	75	56	29.077	29.003	28.996	29.025	.452
....	....	100	Cir.cu	50	Cir.cu	5	Cir.st.	N E	1	N E	2	S W	1	74	52	29.062	29.031	29.009	29.034	.420
....	....	100	Cir.st.	100	Nim.	10	Nim.	N E	1	....	0	N E	1	67	57	29 012	28.982	28.932	28.975	.469
.546	....	40	Cu.st.	100	Cir.cu	9	Cu.	S W	1	N E	1	....	0	79	61	28.939	28.926	28.943	28.930	.604
....	....	70	Cir.	10	Cu.	0	......	....	0	S W	1	....	0	84	61	29.033	29.000	29.010	29.014	.685
....	....	20	Cu.	100	Cir.cu	10	Cu.	S W	2	S W	2	....	0	86	65	29.038	29.008	28.969	29.005	.720
3.381	....	......	......	......	......	......	......	....	..	....	..	....	..	......	.....	......	......	......	......	......
....	....	55.1	......	63.2	......	41.9	......	....	..	....	..	....	..	74°.9	52°.8	......	......	......	28.953	.527
....		53.4						....						....	....	....				

TEOROLOGICAL OBSERVATIONS FOR THE MONTH OF SEPTEMBER, 1865.

AND SNOW.			CLOUDS.						WINDS.						Max. Thermometer.	Min. Thermometer.	BAROMETER HEIGHT REDUCED TO FREEZING POINT.				FOR V
			7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.								
rain or snow.	Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.			7 A. M.	2 P. M.	9 P. M.	Mean.	7 A. M.
....	....	....	100	Cu. st.	100	Cu.	20	St.	....	0	S E	1	S W	1	80	65	28.887	28.924	28.887	28.932	
. M.	.154	....	100	Nim.	90	Cu.	50	Cu.	....	0	S	1	....	0	85	66	28.855	28.781	28.757	28.797	
P.M.	.412	....	100	Cu.	100	Nim.	80	Cu.	S W	1	S W	3	....	0	80	65	28.829	28.829	28.470	28.835	
....	....	....	20	St.	90	Cu.	100	Cir. cu	S W	1	S W	3	S W	1	84	64	28.920	28.886	28.841	28.882	
. M.	.020	....	90	Cu. st.	100	Cu. st.	100	Cu.	N W	1	....	0	N W	1	77	55	28.923	28.880	28.863	28.888	
....	....	....	50	Cir.	20	Cu. st.	100	Cir. st.	S W	1	S W	2	....	0	77	53	28.863	28.854	28.855	28.854	
....	....	....	100	Cir. st.	100	Nim.	100	Nim.	N	1	N	1	N	1	77	60	28.876	28.860	28.780	28.838	
. M.	1.300	....	100	Nim.	100	Nim.	100	Cu.	....	0	S W	3	S W	2	74	62	28.590	28.660	28.723	28.657	
....	....	....	100	Cu.	40	Cu.	00	......	S W	1	S W	1	S W	1	79	64	28.863	28.854	28.880	28.865	
....	....	....	100	Cir. cu	100	Cir. cu	100	Nim.	S W	1	S W	3	S	4	85	55	28.880	28.816	28.826	28.840	
. M.	.296	....	00	......	10	Cu.	00	......	S W	1	W	3	....	0	84	47	28.878	28.880	28.929	28.892	
....	....	....	70	Cir. cu	90	Cu. st.	60	Cu.	N E	1	S	2	W	2	77	56	28.952	28.966	28.936	28.951	
....	....	....	100	Cu. st.	60	Cir. cu	100	Nim.	....	0	S E	1	E	1	81	65	29.008	28.964	29.007	28.993	
. M.	2.82	....	100	Cu.	100	Cir. cu	100	Cu.	S W	2	S W	3	....	0	81	61	29.012	29.008	28.992	29.004	
....	....	....	50	Cir. cu	10	Cir. st.	00	......	N E	3	E	2	....	0	74	49	29.159	29.167	29.143	29.155	
....	....	....	90	Cir. cu	80	Cu.	00	......	S	1	S	3	S W	2	81	59	29.134	29.040	28.965	29.046	
. M.	.680	....	100	Cir. st.	100	Nim.	100	Nim.	S	2	E	3	N E	3	74	47	28.910	28.887	28.914	28.903	
....	....	....	90	Cir. cu	60	Cu.	00	......	N E	3	N E	4	....	0	68	34	29.031	29.060	29.084	29.058	
....	....	....	00	......	10	Cir. st.	10	St.	....	0	S	1	....	0	66	41	29.096	29.140	29.117	29.117	
....	....	....	100	Cir. cu	50	Cir. cu	40	Cir. st.	....	0	S W	2	....	0	71	48	29.070	29.053	29.064	29.062	
....	....	....	100	Cir. cu	80	Cir. cu	50	Cu.	....	0	S W	2	....	0	75	54	29.023	29.022	29.028	29.024	
....	....	....	90	Cir. cu	20	Cu.	00	......	....	0	S W	1	....	0	77	57	29.045	20.069	29.073	29.062	
....	....	....	20	Cir.	40	Cir. cu	60	Cir. cu	S W	1	S W	1	....	0	79	62	29.101	29.045	29.021	29.055	
. M.	1.326	....	100	Nim.	100	Nim.	60	Cu.	S W	2	S W	2	S W	1	68	58	28.991	28.979	28.979	28.983	
....	....	....	100	Cu.	10	Cu.	00	......	N	1	N W	2	....	0	69	45	28.979	28.976	28.997	28.980	
....	....	....	Foggy	......	10	Cu.	10	St.	E	1	S E	2	....	0	68	41	29.103	29.106	29.117	29.108	
....	....	....	50	Cu.	60	Cir.	30	Cir. st.	E	1	E	1	E	2	72	50	29.151	29.146	29.119	29.138	
....	....	....	90	Cu. st.	70	Cu. st.	60	Cir. cu	E	1	S	1	....	0	79	50	29.105	29.039	29.039	29.061	
ght.	.322	....	70	Cu. st.	100	Nim.	100	Nim.	S W	2	S W	4	W	2	76	44	28.884	28.882	28.917	28.894	
....	....	....	00	......	60	Cu.	00	......	S W	1	S W	4	....	0	64	43	28.902	28.839	28.849	28.863	
....	4.792	....	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......	
....	....	....	72.6	......	66	......	51	......	....	..	....	..	....	..	76°.06	54°.33	......	......	......	28.954	
....			63.2						....						....		....				

METEOROLOGICAL OBSERVATIONS FOR THE MONTH OF OCTOBER, 1865.

IN AND SNOW.			CLOUDS.						WINDS.						Max. Thermometer.	Min. Thermometer.	Barometer Height Reduced to Freezing Point.			
			7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.							
Time of ending of rain or snow.	Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.			7 A. M.	2 P. M.	9 P. M.	Mean.
......	....	....	30	Cu. st.	30	Cir. cu	00	......	S W	1	W	4	N W	1	66	31	28.797	28.707	28.614	28.706
......	....	....	00	......	30	Cu.	100	Cu.	....	0	W	3	....	0	57	38	28.835	28.845	28.853	28.844
......	....	....	100	Cu.	100	Cu.	00	......	W	1	W	2	W	2	51	31	28.914	28.913	28.886	28.904
......	....	....	00	......	10	Cu.	00	......	N W	2	N W	2	N W	1	55	30	29.946	28.966	28.970	28.960
......	....	....	00	......	10	Cu.	00	......	....	0	....	0	....	0	57	30	29.038	29.043	29.064	29.048
......	....	....	00	......	10	Cu.	00	......	..	0	N W	2	S W	1	62	35	29.133	29.104	29.037	29.091
¼ P.M.	.142	....	100	Cir. st.	50	Cir. cu	50	Cu.	S W	2	S W	3	S W	1	72	52	29.002	28.921	28 902	28.941
......	....	....	100	Cu.	10	Cu.	00	......	W	1	W	2	....	0	59	40	28.958	28.946	28.913	28.939
......	....	....	80	Cir. cu	10	Cir.	00	......	S W	1	S W	2	....	0	74	47	28.891	28.888	28.868	28.887
......	....	....	00	......	20	Cu.	00	......	W	1	S W	2	....	0	74	42	28.991	29.980	28.931	28.913
......	....	....	00	......	30	Cu.	00	......	....	0	W	3	....	0	73	44	28.967	28.947	28.893	28.969
......	....	....	100	Cu	80	Cu.	30	Cu.	N E	3	E	3	W	1	55	35	28.982	29.003	29.031	29.005
......	....	....	100	Cu.	30	Cu.	10	Cu. st.	N E	2	N E	1	....	0	55	33	28.991	28.948	28.891	28.943
......	....	....	10	Cu.	100	Cu.	100	Cu.	....	0	W	2	W	1	56	33	28.727	28.660	28.642	28.876
A. M.	.038	....	100	Nim.	100	Cu.	70	Cu.	N W	3	N	3	....	0	46	25	28.691	28.802	28.898	28.863
......	....	....	50	Cir. st.	100	Cir. cu	90	Cu.	S W	1	S W	2	....	0	48	30	29.021	29.033	29.014	29.022
......	....	....	100	Cir. cu	100	Cu.	100	Nim.	S W	1	S W	3	S	3	51	37	28.950	28.815	28.690	28.751
A. M.	.200	....	100	Cu.	100	Cu.	100	Cu.	S W	1	N E	1	....	0	52	34	28.533	28.538	28.535	28.532
......	....	....	100	Nim.	10	Cu.	20	Cu.	S W	3	S W	4	W	1	56	34	28.537	28.297	28.368	28.368
......	....	....	00	......	10	Cu.	00	......	S W	1	S W	4	....	0	54	22	28.538	28.604	28.701	28.614
......	....	....	00	......	10	Cu. st.	30	Cu.	S W	1	S W	2	....	0	49	26	28.910	28.910	28.974	28.933
ght.	.218	....	20	Cu. st.	100	Cu. st.	100	Cu.	S	1	S W	1	S	2	56	30	28.997	28.942	28.913	28.950
......	....	....	100	Cu.	00	......	10	Cu.	N E	2	N E	2	N E	2	58	32	29.059	29.090	29.117	29.088
......	....	....	100	Cu. st.	100	Cu.	100	Cu.	N E	1	N E	2	N E	3	45	35	29.186	29.187	29.154	19.175
......	....	....	10	Cir. st.	100	Cir. cu	50	Cir. st.	N E	2	N E	1	....	0	47	37	29 068	29.022	28.947	29.012
......	....	....	100	Nim.	100	Nim.	100	Nim.	N E	2	N E	2	N E	2	44	33	28.909	28.925	28.942	28.925
......	....	....	100	Nim.	100	Nim.	100	Nim.	N E	3	N E	3	N E	3	36	30	28.917	28.821	28.686	28.808
P. M.	2.170	....	100	Nim.	100	Nim,	50	Cir. cu	N	2	N W	2	N W	1	35	24	28.605	28.740	28.942	28.762
......	....	....	10	Cir. st	10	Cir. cu	00	......	....	0	S W	3	....	0	44	21	29.017	29.046	29.129	29.064
......	....	....	100	Cir. st.	100	Cu.	100	Cir. st.	....	0	S	1	....	0	46	27	29.156	29.104	29.056	29.105
½ A.M.	.020	....	100	Cir. cu	90	Cu.	100	Cu.	S W	1	S W	3	S W	1	46	33	29.007	29.072	29.103	29.060
......	2.788	....	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......
......	....	....	61	......	56	......	45	......	...	..	....	..	....	..	54°.06	36.°5	......	......	......	28.905
....	....	....			54				....	....	....	....	....	....	......	......	....	....	....	....

TEOROLOGICAL OBSERVATIONS FOR THE MONTH OF NOVEMBER, 1865.

AND SNOW.			CLOUDS.						WINDS.						Max. Thermometer.	Min. Thermometer.	Barometer Height Reduced to Freezing Point.			
			7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.							
rain or snow.	Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.			7 A. M.	2 P. M.	9 P. M.	Mean.
....	......	......	100	Cu.	100	Cu.	50	Cu:	S E	1	S E	3	S W	1	49	35	29.077	28.875	28.738	28.897
. M.	.350	......	100	Nim.	90	Cu.	50	Cu.	S W	2	S W	2	S W	1	46	31	28.812	28.934	28.994	28.913
....	......	......	100	Cu.	100	Cu.	50	Cir. st.	S W	1	S W	3	S W	2	46	28	28.977	28.921	28.820	28.906
. M.	.020	......	100	Nim.	100	Cu.	100	Cu.	S W	2	W	3	W	2	42	25	28.687	28.665	28.739	28.697
....	......	......	100	Cu.	70	Cu.	00	......	N W	3	W	3	S W	2	35	26	28.950	29.018	28.988	28.985
....	......	......	10	Cu. st.	100	Cu.	20	Cu.	S W	3	W	4	N W	3	45	20	28.668	28.678	29.036	28.794
....	......	......	00	......	100	Cir. cu	00	......	....	0	E	1	N	3	40	25	29.223	29.257	29.161	29.214
....	......	......	20	St.	60	Cir. cu	00	......	S	1	S W	2	....	0	52	23	29.026	28.929	28.927	28.961
....	......	......	10	St.	00	......	00	......	....	0	S E	2	....	0	44	21	29.189	29.244	29.295	29.243
....	......	......	100	Cir. st.	20	Cu.	00	......	E	1	E	3	E	1	42	19	29.420	29.432	29.464	29.439
....	......	......	10	St.	00	......	10	St.	....	0	E	2	....	0	44	19	29.416	29.378	29.354	29.383
....	......	......	20	Cu. st.	70	Cir. st.	10	St.	....	0	S W	2	S W	1	54	24	29.267	29.218	29.158	29.214
....	......	......	10	Cu. st.	70	Cir. st.	00	......	S W	1	S W	2	S W	2	60	33	29.025	28.944	28.898	28.956
....	......	......	80	Cir. cu	80	Cir. st.	00	......	....	0	S	2	S W	2	62	36	28.816	28.871	28.738	28.808
....	......	......	100	Cu.	40	Cir. cu	10	St.	S W	2	S W	2	S W	1	58	38	28.808	28.781	28.803	28.797
....	......	......	100	Cir. st.	70	Cir. st.	100	Cu. st.	S W	1	S W	3	S W	4	66	45	28.801	28.676	28.599	28.692
....	......	......	100	Cu. st.	80	Cu.	80	Cu. st.	S W	5	W	4	W	2	49	32	28.720	28.911	29.031	28.887
....	......	......	90	Cu. st.	100	Cu. st.	20	Cu.	S W	1	S W	1	....	0	43	20	29.056	29.010	28.996	28.031
....	......	......	10	St.	80	Cir. cu	10	St.	S E	1	S	1	S W	1	45	21	29.089	28.070	29.063	29.074
....	......	......	20	St.	20	Cir. st.	10	St.	S E	1	S W	1	....	0	48	23	28.961	28.878	28.883	28.907
....	......	......	90	Cu. st.	100	Cu. st.	100	Cu. st.	S W	1	S W	2	N W	2	41	30	28.851	28.815	28.796	28.821
....	......	......	100	Cu. st.	100	Cu. st.	100	Cu. st.	N W	2	N W	3	W	3	41	32	28.841	28.688	28.746	28.758
....	......	......	100	Cu. st.	100	Cu. st.	00	......	N	3	N W	1	....	0	40	20	28.849	28.803	28.961	28.904
....	... ...	.. . .	10	St.	00	......	10	St.	S E	1	S	1	S	2	45	18	29.054	29.023	28.939	29.005
....	......	......	10	Cir.	30	Cir.	30	Cir.	S W	1	N W	2	N W	1	47	19	28.947	28.994	29.053	28.995
....	......	......	70	Cir. st.	20	Cir.	00	......	S W	1	S W	1	....	0	43	21	29.097	29.054	29.028	29.059
....	......	......	10	St.	90	Cu. st.	.00	......	W	1	N W	3	....	0	40	17	29.037	29.101	29.187	29.108
....	......	......	100	Cu. st.	100	Cu. st.	10	Cu. st.	N E	1	E	2	E	2	35	21	29.071	28.981	28.875	28.976
....	......	......	90	Cu. st.	100	Cir. st.	100	Cu. st.	N E	1	S W	2	S W	3	40	30	28.827	28.746	28.648	28.740
. M.	.310	......	100	Cu. st.	100	Nim.	100	Cu. st.	S W	4	S W	3	S W	4	37	20	28.363	28.155	28.267	28.262
....	.680	......	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......
....	......	......	62	......	69.6	......	32	......	...	..	....	..	....	..	45°.97	25°.73	......	......	......	28.947
....			54.5						....						....	....	....			

TEOROLOGICAL OBSERVATIONS FOR THE MONTH OF DECEMBER, 1865.

AND SNOW.			CLOUDS.						WINDS.						Max. Thermometer.	Min. Thermometer.	BAROMETER HEIGHT REDUCED TO FREEZING POINT.				FORC VA
			7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.								
	Amount of rain or melted snow in gauge, in inches.	Depth of snow, in inches.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Per centage of cloudiness.	Kinds of clouds.	Direction.	Force.	Direction.	Force.	Direction.	Force.			7 A. M.	2 P. M.	9 P. M.	Mean.	7 A. M.
...	....	....	100	Cu. st.	70	Cu. st.	100	Cu. st.	W	4	W	2	S E	1	32	20	28.474	28.531	28.549	28.518	.1
...	....	....	100	Cu. st.	100	Smoke	100	Smoke	S E	2	S E	2	N E	1	40	25	28.404	28.496	28.562	28.487	.1
M.	.30	....	100	Cu. st.	100	Nim.	100	Nim.	N W	1	E	1	N E	1	40	28	28.797	28.762	28.672	28.744	.1
...	....	....	100	Cu. st.	100	Cu. st.	100	Cu. st.	W	1	W	2	N	2	43	21	28.855	29.083	29.156	29.031	.2
...	....	....	20	St.	30	St.	00	......	S W	1	W	1	W	1	34	13	29.304	29.266	29.166	29.245	.1
...	....	....	30	St.	100	Cu. st.	100	Cu. st.	....	0	E	1	S E	1	33	13	29.084	28.894	28.758	28.912	.0
...	....	....	100	Cu. st.	10	Cu.	00	......	N	3	N W	2	....	0	32	9	28.772	28.973	29.154	28.966	.1
...	....	....	30	Cir. st.	10	St.	00	......	....	0	S	1	....	0	31	14	29.185	29.217	29.116	29.173	.0
M.	.02	¼	100	Cu. st.	100	Nim.	50	Cu. st.	S E	1	S W	2	S W	2	33	22	28.891	28.735	28.711	28.779	.1
...	....	....	100	Cu st.	40	Cir. st.	70	Cu. st.	S W	2	S W	3	....	0	43	27	28.696	28.596	28.628	28.640	.1
...	....	....	90	Cu. st.	100	Cir. st.	30	Cu st.	N E	1	S E	3	S E	4	48	34	28.672	28.608	28.476	28.585	.1
...	....	....	100	Cu. st.	90	Cu. st.	100	Cu. st.	S W	4	W	5	W	3	49	11	28.457	28.673	28.963	28.698	.2
...	....	....	100	Cu. st.	100	Cu. st.	100	Cu. st.	S W	3	S W	3	W	3	20	0	29.228	29.245	29.251	29.241	.0
...	....	....	100	Nim.	60	Cir. cu	50	Cir. st.	N W	4	S W	3	S W	2	13	-3	29.255	29.282	29.261	29.266	.0
...	....	....	90	Cu. st.	90	Cu. st	100	Cu. st.	W	1	S W	2	S W	2	13	-3	29.201	29.152	29.124	39.159	.0
...	....	....	80	Cu. st.	100	Cu. st.	40	Cu. st.	S E	1	S E	1	S E	1	14	-1	29.052	28.914	28.853	28.940	.0
...	....	....	10	St.	60	Cir. st.	30	St.	S E	1	S W	1	....	0	27	7	28.903	28.966	28.994	28.954	.0
...	....	....	100	Cu. st.	100	Nim.	100	Nim.	E	1	S E	1	S E	1	35	18	28.984	28.844	28.816	28.881	.1
M.	.08	....	100	Nim.	100	Cu. st.	......	......	S W	4	W	4	N W	3	35	12	28.616	28.667	28.872	28.718	.2
...	....	....	90	Cu. st.	100	Nim.	100	Nim.	S E	1	E	2	N E	2	22	8	28.929	28.632	28.343	28.615	.0
M.	.80	8	100	Nim.	100	Nim.	100	Cu. st.	S W	1	S W	3	S W	3	17	1	28.794	28.661	29.101	28.852	.0
...	....	....	80	Cir. cu	80	Cu.	100	Cu. st.	S W	1	W	3	W	2	13	-13	29.012	29.270	29.367	29.216	.0
...	....	....	20	St.	30	Cir. st.	100	Cu. st.	S W	1	S W	2	S E	3	30	-5	29.366	29.238	28.921	29.108	.0
...	....	....	100	Cu. st.	80	Cir. st.	00	......	S W	3	S W	2	S W	4	35	21	28.575	28.391	28.415	28.460	.1
...	....	....	90	Cir. st.	10	Cu. st.	100	Cu.	S W	3	S W	1	....	0	42	22	28.613	28.710	28.706	28.676	.1
...	....	....	100	Fog.	100	Fog.	100	Nim.	E	1	W	1	....	0	35	29	28.542	28.584	28.489	28.538	.1
M.	.23	1½	100	Nim.	100	Cu. st.	100	Cu. st.	W	1	W	1	S W	1	37	28	28.812	28 976	29.024	28.937	.1
...	....	....	100	Cu. st.	100	Cu. st.	90	Cu.	S W	1	W	3	W	1	33	17	28.974	28.974	29.141	29.029	.1
...	....	....	70	Cu.	60	Cir. cu	100	Cir. cu	W	1	S	2	S E	1	29	14	29.260	29.024	29.169	29.226	.0
...	....	....	20	Cir. st.	20	Cu.	10	St.	S E	1	S W	2	S W	1	31	13	29.018	29.104	29.003	29.042	.0
...	....	....	30	St.	100	Cu. st.	90	Cu.	S W	4	S W	3	S W	3	35	22	28.918	28.841	28.917	28.892	.1
...	1.43	9¾	......	......	......	......	......	......	....	..	....	..	....	..	......	......	......	......	......	......	...
...	....	....	79	......	75.4	......	69.7	......	....	..	....	..	....	..	31°.42	13°.68	......	......	......	28.891	.1
....	....		74.7						....						......	......	....				

WINDS.

This is for the record of the direction *from* which the wind is blowing as indicated by a vane, and its force by estimation. The direction is entered in eight points of compass: N., N. E., E., S. E., S., S. W., W., N. W. The force is to be estimated and registered by the following table, in figures from 1 to 10:

1.	Very light breeze,	2	miles	per hour.
2.	Gentle breeze,	4	“	“
3.	Fresh breeze,	12	“	“
4.	Strong wind,	25	“	“
5.	High wind,	35	“	“
6.	Gale,	45	“	“
7.	Strong gale,	60	“	“
8.	Violent gale,	75	“	“
9.	Hurricane,	90	“	“
10.	Most violent hurricane,	100	“	“

ABSTRACT OF METEOROLOGICAL REPORT FOR 1865.

Mean Hight Barometer (at 32°)	28.881 inches.
Mean Thermometer, open air,	47°.70
Mean Register Thermometer, Max.,	54°.04
“ “ “ Min.,	33°.75
Mean percentage of cloudiness,	63.08
Rainfall,	29.821 inches.

DIRECTION OF WIND.

N. E. and E.,	177	observations.
S. E. and S.,	139	“
S. W. and W.,	489	“
N. W. and N.,	99	“

Highest temperature,	June 17th,	91°
Lowest “	Feb. 12th,	17°
Range,		108°

FIRST APPEARANCE OF MIGRATORY BIRDS, &C.

Blackbirds, March 5th; Cedar Birds, March 12th; Blue Birds, March 15th; Robins and Meadow-Larks, March 16th.

Frogs sing, March 28th.

TREASURER'S REPORT.

Joseph Mills, Treasurer, in account with State Board of Agriculture.

DR.

1865.			
March	22.	To cash of S. Howard, Secretary,	$1,544 21
“	30.	“ State Treasurer,	3,000 00
April	1.	“ S. Howard, Secretary	350 00
“	6.	“ “ “	250 00
June	2.	“ State Treasurer,	4,000 00
“	29.	“ S. Howard, Secretary,	832 02
July	6.	“ “ “	1,052 09
Aug.	1.	“ “ “	460 57
“	“	“ State Treasurer,	2,000 00
April	21.	“ S. Howard, Secretary,	100 00
“	22.	“ “ “	182 06
Aug.	30.	“ “ “	402 06
“	31.	“ State Treasurer,	3,000 00
Oct.	13.	“ “	3,000 00
Nov.	27.	“ S. Howard, Secretary, Sept.,	242 82
		“ “ “ Oct.,	406 48
		“ “ “ Nov.,	420 82
Dec.	23.	“ “ “	1,549 21
			$22,792 34

CR.

1865.	
By paid warrant No. 283	$ 250 00
“ “ 284	33 60
“ “ 285	30 00
“ “ 286	10 67
“ “ 287	88 00
“ “ 288	200 00
“ “ 289	760 00
“ “ 290	100 00
“ “ 291	300 00

By paid warrant No.	292	$ 50 00
“ “	293	62 00
“ “	294	250 00
“ “	295	250 00
“ “	296	250 00
“ “	297	250 00
“ “	298	300 00
“ “	299	83 00
“ “	300	100 00
“ “	301	200 00
“ “	302	450 00
“ “	303	50 00
“ “	304	100 00
“ “	305	300 00
“ “	306	35 00
“ “	307	251 90
“ “	308	76 90
“ “	309	150 00
“ “	310	49 67
“ “	311	90 77
“ “	312	75 00
“ “	313	150 00
“ “	314	125 00
“ “	315	50 00
“ “	316	110 15
“ “	317	150 00
“ “	318	100 00
“ “	319	2 22
“ “	320	42 50
“ “	321	11 43
“ “	322	82 50
“ “	323	8 28
“ “	324	145 57
“ “	325	28 00
“ “	326	34 65
“ “	327	76 00
“ “	328	76 78
“ “	329	4 90
“ “	330	29 25
“ “	331	44 10
“ “	332	28 75
“ “	333	55 75
“ “	334	58 00

By paid warrant	No.	335	$ 14 42
“	“	336	35 00
“	“	337	254 59
“	“	338	200 00
“	“	339	100 00
“	“	340	90 90
“	“	341	200 00
“	“	342	282 06
“	“	343	250 00
“	“	344	150 00
“	“	345	200 00
“	“	346	312 50
“	“	347	125 00
“	“	348	250 00
“	“	349	312 50
“	“	350	112 50
“	“	351	100 00
“	“	352	100 00
“	“	353	468 75
“	“	354	50 00
“	“	355	99 00
“	“	356	36 64
“	“	357	36 80
“	“	358	60 65
“	“	359	178 92
“	“	360	300 00
“	“	361	5 82
“	“	362	24 50
“	“	363	13 00
“	“	364	200 00
“	“	365	111 24
“	“	366	448 58
“	“	367	160 60
“	“	368	250 00
“	“	369	150 00
“	“	370	156 25
“	“	371	62 70
“	“	372	100 00
“	“	373	48 00
“	“	374	50 00
“	“	375	69 75
“	“	376	78 75
“	“	377	150 00
“	“	378	150 00

By paid warrant	No.	379	$ 125 00
“	“	380	41 00
“	“	381	63 00
“	“	382	104 41
“	“	383	80 00
“	“	384	65 25
“	“	385	30 00
“	“	386	18 21
“	“	387	10 73
“	“	388	5 07
“	“	389	100 00
“	“	390	47 00
“	“	391	244 56
“	“	392	50 00
“	“	393	50 00
“	“	394	31 30
“	“	395	135 00
“	“	396	300 00
“	“	397	114 41
“	“	398	125 00
“	“	399	35 00
“	“	400	21 14
“	“	401	10 21
“	“	402	125 00
“	“	403	20 00
“	“	404	150 00
“	“	405	25 25
“	“	406	75 00
“	“	407	156 25
“	“	408	200 00
“	“	409	28 00
“	“	410	156 25
“	“	411	112 50
“	“	412	150 00
“	“	413	250 00
“	“	414	125 00
“	“	415	162 50
“	“	416	55 07
“	“	417	250 00
“	“	418	100 00
“	“	419	112 50
“	“	420	12 00
“	“	421	18 19
“	“	422	9 06

By paid warrant No.	423	$ 40 00
“ “	424	400 00
“ “	425	252 32
“ “	426	200 00
“ “	427	200 00
“ “	428	200 00
“ “	429	71 96
“ “	430	25 00
“ “	431	16 50
“ “	432	59 90
“ “	433	82 56
“ “	434	50 00
“ “	435	150 00
“ “	436	275 00
“ “	437	71 15
“ “	438	27 13
“ “	439	100 00
“ “	440	72 50
“ “	441	100 00
“ “	442	150 00
“ “	443	12 75
“ “	444	200 00
“ “	445	20 42
“ “	446	300 00
“ “	447	22 56
“ “	448	177 89
“ “	449	300 00
“ “	466	337 60
“ “	467	511 63
“ “	468	159 53
“ “	469	163 80
“ “	470	76 16
“ “	471	149 82
“ “	472	120 67
Nov. 30. Balance to new account,		436 57
		$22,792 34
Dec. 1. To balance from old account,		$436 57

JOSEPH MILLS, *Treasurer.*

WARRANT STATEMENT of the Secretary of the Agricultural College, for the year ending December 1, 1865.

Number.	1865.	To Whom Payable.	Object.	Amount.
283	Feb. 23	M. Miles,..........	Salary,..............................	$250 00
284	" 23	John A. Kerr & Co.,	Binding Books, ...	33 60
285	" 23	T. C. Abbot,.......	Payment of expenses of J. Gage, member of Board, ...	30 00
286	" 23	T. C. Abbot, ...	Postage,............................	10 67
287	" 23	S. S. Rockwell, ...	Salary,.............................	88 00
288	March 10	M. Miles, ...	Farm expenses,.....................	200 00
289	" 10	S. S. Rockwell,.....	Boarding Hall,......................	760 00
290	" 20	A. N. Prentiss,.....	Garden expenses, ...	100 00
291	" 27	S. S. Rockwell, ...	Boarding Hall, ...	300 00
292	" 27	M. Miles,..........	Farm,................................	50 00
293	April 1	S. S. Rockwell,.....	Salary, ...	62 00
294	" 1	R. C. Kedzie, ...	Salary,.............................	250 00
295	" 1	Oscar Clute, ...	Salary,.............................	250 00
296	" 1	A. N. Prentiss, ...	Salary,.............................	250 00
297	" 1	M. Miles,..........	Salary,.............................	250 00
298	" 1	T. C. Abbot,.......	Salary,.............................	300 00
299	" 1	C. C. Stowe, ...	Salary,.............................	83 00
300	" 1	Geo. T. Fairchild,..	Salary,.............................	100 00
301	" 5	Sanford Howard, ..	Traveling expenses,........... $45 87 Sheep, and expenses on same,. 69 75 Passed to credit of College,.... 84 38	200 00
302	April 11	M. Miles,..........	Span of horses and harness for Farm work, to supply team to Garden,..	450 00
303	April 15	M. Miles,..........	In part for horse for farm, in order to supply Boarding Hall with horse,..	50 00
304	April 15	M. Miles,..........	In full for horse (See No. 303),.......	100 00
305	" 15	S. S. Rockwell,.....	Boarding Hall,......................	300 00
306	" 25	S. S. Rockwell,.....	Harness,............................	35 00
307	" 25	M. Miles,..........	Hardware bill—for garden use, $2 66 Board. Hall,.. 8 91 Farm,........ 240 33	251 90

STATEMENT—Continued.

Number.	1865.	To Whom Payable.	Object.	Amount.
308	April 28	S. S. Rockwell, ...	Crockery, ...	$ 76 90
309	May 1	S. S. Rockwell, ...	Boarding Hall,..........................	150 00
310	" 9	S. Lansing & Son,..	Blacksmithing, ...	49 67
311	" 9	John A. Kerr & Co.,	Printing—for Catalogues, 1864, $65 42	
			for Farm,.......... 11 50	
			for adv. and blanks, 12 35	
			refund. by Students, 1 50	90 77
312	May 9	T. C. Abbot, ...	Salary, ...	75 00
313	" 9	S. S. Rockwell, ...	Boarding Hall,..........................	150 00
314	" 22	S. S. Rockwell, ...	Boarding Hall, ...	125 00
315	" 25	S. S. Rockwell, ...	Boarding Hall, ...	50 00
316	June 3	Daniel W. Buck,....	For bedding, bedsteads, &c.,.. $93 60	
			For Farm, pump,............. 11 00	
			For Prof. Clute—refunded,.... 5 55	110 15
317	June 3	Oscar Clute, ...	Books, ...	150 00
318	" 3	M. Miles,..........	Farm, ...	100 00
319	" 3	C. A. Noble,.......	Salary—final settlement, ...	2 22
320	" 3	Lansing & Son, ...	Blacksmithing—for Farm, ... $37 70	
			for Garden, .. 4 80	42 50
321	June 3	O. Clute, ...	Furniture, ...	11 73
322	" 3	L. Bercham,.......	Making 32 r'ds blind drain, Col. Gr'nds	82 50
323	" 3	J. W. Amphlett,...	Furniture for Secy's Office in Lansing,	8 28
324	" 5	T. C. Abbot, ...	Payment of bills for advertising, ...	145 57
325	" 5	E. H. Greene,......	3⅚ doz. chairs, ...	28 00
326	" 5	S. R. Greene,......	Furniture, ...	34 65
327	" 5	S. Dodge,..........	Cultivator and plough, ...	76 00
328	" 5	T. C. Abbot,.......	Postage, rev. stamps, sta't'ry, $28 58	
			Advanced to Students, refund., 30 50	
			Expenses,.................... 17 70	76 78
329	June 5	J. C. Armstrong,...	Furniture for Botanical room,........	4 90
330	" 5	D. M. Dewey,......	146 colored plates of fruits,..........	29 25
331	" 5	T. M. Thorburn,....	Horticultural tools,..................	44 10
332	" 5	B. B. & W. R. Noyes,	Garden tools,.......................	28 75
333	" 5	Wm. Adair,........	Trees, ...	55 75

STATEMENT—Continued.

Number.	1865.		To Whom Payable.	Object.		Amount.
334	June	5	B. A. Gallup, ...	Labor in Garden, ...		$ 58 75
335	"	5	A. N. Prentiss,.....	Garden expenses, ...		14 42
336	"	5	W. W. Daniells,....	Salary, ...		35 00
337	"	6	A. Bertch,.........	Meat for Boarding Hall,..............		254 59
338	"	6	S. S. Rockwell,.....	Boarding Hall,....................		200 00
339	"	6	Geo. T. Fairchild,..	Salary, ...		100 00
340	"	6	A. C. Prutzman,...	Expenses as Member of Board,.......		90 90
341	"	10	M. Miles,..........	Farm,..........................		200 00
342	"	20	A. N. Prentiss, ...	Books,..........................		282 06
343	"	20	O. Clute, ...	Salary, ...		250 00
344	"	20	S. S. Rockwell, ...	Boarding Hall,.....................		150 00
345	"	22	M. Miles,..........	Farm,..........................		200 00
346	"	27	R. C. Kedzie,......	Salary,..........................		312 50
347	"	27	Sanford Howard,...	Salary,..........................		125 00
348	"	27	A. N. Prentiss,.....	Salary,..........................		250 00
349	"	27	M. Miles,..........	Salary,..........................		312 50
350	"	27	S. S. Rockwell,.....	Salary,..........................		112 50
351	"	27	C. C. Stowe,.......	Salary,..........................		100 00
352	"	27	Geo. T. Fairchild,..	Salary,..........................		100 00
353	"	27	T. C. Abbot,.......	Salary,..........................		468 75
354	"	29	S. S. Rockwell, ...	Boarding Hall, ...		50 00
355	"	29	T. C. Abbot,.......	Ex. of Board—A. S. Welch,...	$19 00	
				J. Gage,.......	40 00	
				Chas. Rich,....	40 00	99 00
356	June	30	Advertiser & Trib.,	Advertising, ...		36 64
357	"	30	E. Longyear, ...	Stamped envelopes and stamps,......		36 80
358	July	3	S. S. Rockwell, ...	Boarding Hall......................		60 65
359	"	4	Ivison, Phinney, Blakeman & Co.,	Books,..........................		178 92
360	July	17	S. S. Rockwell, ...	Boarding Hall, ...		300 00
361	"	21	Free Press,........	Advertising, ...		5 82
362	"	26	F. Wetmore & Co.,.	Bowls for Laboratory,..............		24 50
363	"	26	S. R. Greene,......	Lumber and work for Laboratory,...		13 00
364	"	28	S. S. Rockwell, ...	Boarding Hall, ...		200 00

STATEMENT—*Continued.*

Number.	1865.	To Whom Payable.	Object.	Amount.
365	Aug'st 2	Ivison, P., B. & Co.,	Books,	$111 24
366	" 2	M. Miles,	Sheep Barn,	448 58
367	" 2	M. Miles,	Shingles for Sheep Barn,	160 60
368	" 2	M. Miles,	Ditching on big marsh,	250 00
369	" 2	M. Miles,	Farm expenses,	150 00
370	" 2	T. C. Abbot,	Salary,	156 25
371	" 2	Sanford Howard,	Furniture for Office,	62 70
372	" 2	Sanford Howard,	Traveling expenses,	100 00
373	" 2	Cannell & Edmonds,	Harness for the garden team,	48 00
374	" 2	A. N. Prentiss,	Garden expenses,	50 00
375	" 2	Robt. Bercham,	Ditching on College Grounds,	69 75
376	" 4	W. W. Daniells,	Salary,	78 75
377	" 17	M. Miles,	Ditching on Big Marsh,	150 00
378	" 21	M. Miles,	Salary,	150 00
379	" 21	M. Miles,	Expenses (farm),	125 00
380	" 26	R. C. Kedzie,	Chemicals,	41 00
381	" 28	S. S. Rockwell,	Repairs in Boarding Hall,	63 00
382	" 28	S. S. Rockwell,	New Oven,	104 41
383	" 28	S. S. Rockwell,	Boarding Hall,	80 00
384	" 28	Ivison, P., B. & Co.,	Books,	65 25
385	" 28	Abner Brown,	Repairs in Boarding Hall,	30 00
386	" 28	F. Wells,	Paints, and sundries for Garden,	18 21
387	" 28	Cannell & Edmonds,	Harness repairs for Garden,	10 73
388	" 28	Cannell & Edmonds,	Harness repairs for Farm,	5 07
389	" 28	S. S. Rockwell,	Boarding Hall,	100 00
390	" 29	Jacob Baumgras,	Graining the College Chapel,	47 00
391	" 30	T. C. Abbot,	Exp. of Board meetings (See No. 431),	244 56
392	" 30	M. Miles,	Sheep Barn,	50 00
393	" 30	Geo. T. Fairchild,	Salary,	50 00
394	" 30	T. C. Abbot,	Postage, $10 83	
			Students' work, 10 74	
			Furniture and Sec.'s expenses, 9 73	31 30
395	Aug. 30	M. Miles,	Ditching on Big Marsh,	135 00
396	Sept. 2	S. S. Rockwell,	Boarding Hall,	300 00

STATEMENT—Continued.

Number.	1865.		To Whom Payable.	Object.	Amount.
397	Sept.	4	S. S. Rockwell,.....	Boarding Hall,..........	$114 41
398	"	7	W. H. Andrus,.....	Lumber for Sheep Barn,.............	125 00
399	"	8	W. W. Daniells, ...	Salary,..............................	35 00
400	"	8	Oscar Clute,.......	Furniture & rep'rs, for Lab'ry,.$1 55	
				for Botanical room, ... 3 00	
				for Mail-bag,.............. 2 00	
				for team, pails, putty, &c.,. 7 11	
				for Amphlett's bill, &c.,.... 3 48	21 14
401	Sept.	8	Oscar Clute,.......	Entomological pins,................	10 21
402	"	8	Sanford Howard,..	Salary,..............................	125 00
403	"	8	S. S. Bailey,.......	8 bu. early Bought'n wheat and 4 bags,	20 00
404	"	8	M. Miles,..........	Ditching on Big Marsh, ...	150 00
405	"	8	Home Insur'nce Co.,	Insurance of Barns and contents,.....	25 25
406	"	16	S. S. Rockwell,....	Boarding Hall,......................	75 00
407	"	16	T. C. Abbot,.......	Salary,..............................	156 25
408	"	16	R. C. Kedzie,......	Salary,..............................	200 00
409	"	18	C. C. Stowe,.......	Farm,...............................	28 00
410	"	18	T. C. Abbot,.......	Salary,..............................	156 25
411	"	30	R. C. Kedzie,......	Salary,..............................	112 50
412	"	30	Geo. T. Fairchild,..	Salary,..............................	150 00
413	"	30	A. N. Prentiss,....	....	250 00
414	"	30	A. N. Prentiss,.....	Green House,........................	125 00
415	"	30	M. Miles,.....	Salary,............................	162 50
416	"	30	J. Nall, Jr., & Co.,..	Carpet,.............................	55 07
417	"	30	Oscar Clute,.......	Salary,..............................	250 00
418	"	30	C. C. Stowe, ...	Salary,..............................	100 00
419	"	30	S. S. Rockwell, ...	Salary,..............................	112 50
420	Oct.	11	L. G. Berry,.......	Expenses as Treasurer,..............	12 00
421	"	11	F. Wells, ...	Paints, &c., for College Chapel,.......	18 19
422	"	11	State Reform Sch'l,	Chairs,..............................	9 06
423	"	11	Sanford Howard,..	Engraving and drawing Sheep,.......	40 00
424	"	16	S. S. Rockwell,....	Boarding Hall,......................	400 00
425	"	16	M. Miles,..........	Sheep Barn, ...	252 32
426	"	16	M. Miles,..........	Ditching on Big Marsh,..............	200 00

STATEMENT—Continued.

Number.	1865.	To Whom Payable.	Object.	Amount.
427	Oct. 16	M. Miles,..........	Sheep Barn,..........................	$200 00
428	“ 16	M. Miles,..........	Sheep Barn,..........................	200 00
429	“ 26	Ivison, P., B. & Co.,	Books,..............................	71 96
430	“ 26	Geo. T. Fairchild,..	Salary,.............................	25 00
431	“ 28	T. C. Abbot,.......	Ex. of Board—Mr. Prutzman,.. $28 60	
			Mr. Gage,...... 57 30	
			Mr. Carpenter,. 65 66	
			Mr. Wells,..... 74 50	
			Mr. Welch,..... 35 00	
			in all equal to the sum of this warrant and No. 391,................	16 50
432	Oct. 28	Bush & Barker,....	Mason work on roof of B. Hall, $ 3 50	
			on cisterns (3),.. 56 40	59 90
433	Nov. 4	P. N. Gallup,......	Labor in Garden,....................	82 56
434	“ 7	W. W. Daniells,....	Salary,.............................	50 00
435	“ 7	M. Miles,..........	Ditching on Big Marsh,..............	150 00
436	“ 7	S. S. Rockwell,....	Boarding Hall,......................	275 00
437	“ 8	S. Howard,........	Work and furniture, Office in Lansing,	71 15
438	“ 13	Oscar Clute,.......	Repairs in B. Hall ($22 13 on cisterns),	27 13
439	“ 14	S. S. Rockwell,.....	Boarding Hall,......................	100 00
440	“ 14	W. W. Daniells,....	Salary,.............................	72 50
441	“ 15	Geo. T. Fairchild,..	Salary,.............................	100 00
442	“ 15	R. C. Kedzie,......	Salary,.............................	150 00
443	“ 15	A. Brown,.........	Work on College Hall,...............	12 75
444	“ 17	M. Miles,..........	Ditching on Big Marsh,..............	200 00
445	“ 17	Sanford Howard,...	Curtains for Office and hangings,....	20 42
446	“ 17	M. Miles,..........	Galloway Cattle and Cotswold Sheep,..	300 00
447	“ 24	M. Miles,..........	Expenses on taking down privy,.....	22 56
448	“ 24	M. Miles,..........	Expenses on building new privy,....	177 89
449	“ 24	T. C. Abbot,.......	Salary,.............................	300 00
450	“ 30	John A. Kerr & Co.,	For advertising,.............. $5 50	
			Catalogues,........... ... 67 49	
			Sec'y's Office at College,... 57 50	
			“ “ Lansing,.. 19 50	149 99

STATEMENT—Continued.

Number.	1865.	To Whom Payable.	Object.		Amount.
451	Nov. 30	T. C. Abbot,.......	Refunded to Students,........	$14 05	
			Refunded by Students,.......	7 50	
			Postage and Express,.........	12 32	
			Ex. as member of Board,.....	17 40	
			Paid Students for work at Col.	8 14	
			Garden—barrels,.............	2 00	
			Secretary's office, furniture,..	1 85	
			Advertising,.................	6 00	
			Repairs on dwelling house,....	4 25	
			Expenses Junior Exhibition,..	7 50	$81 01
452	Nov. 30	Grove & Whitney, .	Chain for well, Fairchild,.....	80	
			Eave troughs, pipes, elbows for dwelling house,...........	17 80	
			Large iron dipper,............	1 00	19 10
453	Nov. 30	Grove & Whitney,..	Furniture and work, Secretary's Office in Lansing,.....................		41 98
454	Nov. 30	Grove & Whitney,..	Farm,.............................		382 87
455	" 30	Grove & Whitney,..	For Garden, A. N. Prentiss,..........		119 81
456	" 30	Grove & Whitney,..	Laboratory,.........................		65 82
457	" 30	Grove & Whitney,..	Oscar Clute, rep'rs and furn. for Col.,		
			Stoves and pipe,..............	$76 94	
			College roof,......	31 69	
			Locks, keys, knobs,..........	22 65	
			Ashpails, sprinklers, &c., &c.,	7 71	
			General repairing, glass, nails, screws,...................	17 19	
			Repairs on Board. Hall, bringing water from roof outside the walls, and for turning water from cistern in College Hall,.....................	43 25	200 83
458	Nov. 30	Grove & Whitney,..	Board. Hall—General repairs,	$16 61	
			Stoves and pipe,..........	36 90	
			Oil cupboard,.............	5 63	

STATEMENT—*Continued.*

Number.	1865.	To Whom Payable.	Object.	Amount.
			Meat box, ... $ 2 09	
			Desk, ... 70	
			Boiler and steam works,... 69 10	
			Furniture and implements, 24 68	
			Oil barrel,............... 19 13	
			For Farm and Sheep barn,. 49 93	$224 82
459	Nov. 30	A. J. Viele,........	Wall paper for Botanical Class-Room,.	11 75
460	" 30	S. R. Greene,......	Work and furniture for Secretary's Office in Lansing, ...	75 15
461	" 30	P. D. Beckwith, ...	Roller Drill,..........................	100 00
462	" 30	T. C. Abbot,.......	Ex. of Board—Mr. Wells,......$24 75	
			Mr. Carpenter,.. 24 45	
			Mr. Gage,....... 39 85	
			Mr. Prutzman,.. 33 10	
			Mr. Rich,....... 50 87	173 02
463	Nov. 30	M. Miles,..........	Sheep Barn, in full, ...	90 84
464	" 30	M. Miles,..........	New Privy,......	123 53
465	" 30	M. Miles,..........	Cattle Shed and Barn, ...	215 33
466	" 30	S. S. Rockwell, ...	Boarding Hall,......................	337 60
467	" 30	S. S. Rockwell, ...	Purchase of meat, &c., from the Farm, less charge for board of hired men on Farm, ...	511 63
468	Nov. 30	M. Miles,..........	Farming Implements, ...	159 53
469	" 30	M. Miles,..........	Work on r'd, Col. gr'nds and building,	163 80
470	" 30	M. Miles,..........	Sheep yards,........................	76 16
471	" 30	M. Miles,..........	Boarding Hall and College repairs,....	149 82
472	" 30	S. S. Rockwell, ...	Vegetables from College Garden,......	120 67
473	" 30	M. Miles,..........	Salary,............................	148 33
474	" 30	A. N. Prentiss,.....	Salary,............................	133 47
475	" 30	O. Clute, ...	Salary,............................	147 79
476	" 30	C. C. Stowe, ...	Salary,............................	66 67
477	" 30	S. S. Rockwell,.....	Salary,............................	75 00
Total, ...				$25,001 88

SECRETARY'S ACCOUNT.

Receipts for the year ending December 1*st*, 1865.

Balance in College Treasury, Dec. 9, 1864,		$ 323 86
Unexpended on warrant, (1864,) returned to Treasury,		857 68
From State Treasury,		15,000 00
Swamp Land Sales,		1,156 61
Receipts from boarding students, and other College bills,		3,686 91
"	Sale of Books,	138 55
"	Rent of Houses,	60 00
"	Sale of Stock,	734 48
"	Cash sales of Farm produce,	152 43
"	Sale of Farm produce to Boarding Hall, less charge for boarding farm hands,	577 29
"	Sale of Garden produce,	120 67
		$22,808 48

Of the above sum, there was paid over to the Treasurer of the College, at sundry times,	22,792 34
Refunded to students, E. T. Barney, $1 33; to C. A. Daniells, $14 81,	16 14
	$22,808 48

SANFORD HOWARD,
Secretary.

RETURNS FROM AGRICULTURAL SOCIETIES.

BARRY COUNTY.

The thirteenth Annual Show of the Barry County Agricultural Society was held on the grounds of the Society, in Hastings, on Wednesday and Thursday, October 11th and 12th, 1865. The whole number of entries for premiums, was 411. Number of members, 255. Amount awarded in premiums, $183. The receipts and expenditures of the Society are stated as follows:

RECEIPTS.

Balance on hand last year, as reported,	$ 66 88
Premiums not claimed, included in last year's report,	20 30
Memberships,	255 00
Tickets and sundries,	139 85
Aid from County, assessed last year,	46 00
	$528 03

EXPENDITURES.

Premiums paid to December 20th,	$159 25
Various incidental expenses,	223 55
Balance in Treasury, December 20th,	145 23
	$528 03

The agriculture of this county, though comparatively in its infancy, is stated to be rapidly improving—the last agricultural show having exhibited a great improvement over those of former years. The address at the show was delivered by Hon. F. W. Shearman, of Marshall. The total receipts at the show were $394 85, being nearly a hundred dollars greater than in 1864; and the premiums awarded, exceeded in amount the previous year, about fifty dollars.

Officers for 1866.—Gilbert Striker, President; J. M. Nevins, Secretary; H. N. Sheldon, Treasurer.

BENZIE COUNTY.

An Agricultural Society has been organized in this new county, and exhibitions were held at Benzonia, in the autumn of 1864, and on the 18th of October, 1865. Rev. J. B. Walker is President of the society, and H. Chapin, Secretary. The reports of the exhibitions in the Grand Traverse *Herald*, show that the products of that region are good, and highly creditable to the cultivators, considering the infancy of the settlement. Specimens of many varieties of Indian corn, including the *dent*, were exhibited, all well ripened. Fruits were well represented. It is said, "the show of pears and peaches was very fine indeed." No premiums were offered, but the whole number of entries was 220.

BERRIEN COUNTY.

The fifteenth Annual Show of the Berrien County Agricultural Society was held on the Society's grounds, at Niles, on the 26th to 28th of September, 1865. All departments of the show compared favorably with any previous exhibition, and in fruits and vegatables, domestic manufactures, &c., a decided improvement is said to have been apparent. The attendance was large. The officers of the Society contemplate the purchase of new grounds, to be in readiness before the time for holding the next show arrives. The tract will consist of thirty acres, immediately adjoining the eastern limits of the city, well watered, and in every manner desirable.

Officers for 1866.—D. O. Woodruff, President; Nathan Fitch, Vice-President; R. W. Landon, Secretary; R. C. Paine, Treasurer.

BRANCH COUNTY.

The operations of this Society for the year 1865, commenced by a public Sheep-shearing, which was held at Coldwater, on the 7th of June. Premiums were offered on the occasion, for which seventeen rams and twelve ewes, all Merinos, competed. No premiums were offered for scoured fleeces, and all the sheep were sheared without washing. It was understood that the rule observable in awarding the premiums, was the greatest weight of fleece in proportion to the weight of carcass. Classes of premiums were arranged for rams and ewes, of the ages of one, two and three years.

The first premium for three-year-old rams was awarded to W. J. Barns and Wm. Joseph, for a ram said to have been bred by Victor Wright, of Middlebury, Vt., which weighed, after shearing, 108 lbs., and whose fleece weighed 19½ lbs.

The first premium for two-year-old rams was awarded to E. Cole, for a ram which weighed 97 lbs., and whose fleece weighed 19½ lbs.

The first premium for yearling rams was awarded to LeFleur and Van Aiken, for a ram which weighed 56 lbs., and whose fleece weighed 12 lbs. The second premium in the same class was awarded to Ansel Nichols, of Quincy, for a ram bred in Vermont, and got by Edwin Hammond's "Sweepstakes," the carcass weighing 83 lbs., and the fleece 15½ lbs. To the same animal, however, was awarded at this exhibition, by another committee, a *sweepstakes prize*, "without regard to age or sex."

On ewes, the first and second premiums for three-year-olds, were awarded to Geo. Van Aiken, the carcass of one weighing 79 lbs., and the fleece 12 lbs.; the carcass of the other, 95¼ lbs., and the fleece 11½ lbs.

The first premium for two-year-old ewes was awarded to Wm. Andrews, the carcass weighing 60½ lbs., and the fleece 9¾ lbs.

The first premium for yearling ewes was awarded to T. N. Barns, the carcass weighing 57½ lbs., and the fleece 13¼ lbs.

A large number of people attended the shearing, and a lecture on sheep and wool was given by Sanford Howard, Secretary of the State Board of Agriculture.

The Society has been particularly unfortunate in regard to the weather at the time of holding its annual shows, it having rained heavily, for several years in succession. The weather for the show of 1865 proved quite as unfortunate as any that had previously been experienced. A severe gale, accompanied by heavy rain, demolished the tent in which most of the articles were exhibited, while it was filled with people, occasioning much inconvenience, though fortunately no serious injury. But notwithstanding the unfavorableness of the weather, the show was financially successful. A particular statement of the finances is not rendered. The Secretary says, "we are now in a better condition, financially and otherwise, than ever before." The Society has resolved to erect a hall and such other buildings as may be necessary, before holding another show. It appears that the Board of Supervisors for the county have offered to appropriate the sum of $398 "for the purpose of aiding in the construction of a building, to be called and known as Floral Hall;" the building to be used for the safe keeping of the ordnance, caissons, and accoutrements of the Coldwater Battery. A proviso is added, "That said Agricultural Society will also agree, in writing, that they will offer no premiums for running horses, and will prohibit and prevent all horse-racing on county fair days, on or over the track on said fair-grounds."

It is probably to be understood that the words "running" and "racing," as above used, were intended to apply to *trotting* as well as racing horses. The Society had not acted in regard to the acceptance of the proposition, when the return of the Secretary was forwarded.

Officers for 1866.—Cyrus G. Luce, President; Albert Chandler, Secretary; Ives G. Miles, Treasurer; with an Executive Committee, consisting of six members.

CALHOUN COUNTY.

The Annual Show of the Calhoun County Agricultural Society was held at Marshall, on the 27th and 28th of September, 1865. The display is represented to have been creditable to the Society. The address was delivered by Ex-Governor Blair. No statement of the financial condition of the Society has been returned.

Officers for 1866.—C. P. Dibble, President; J. M. Parsons, Secretary; C. T. Gorham, Treasurer; with an Executive Committee consisting of five members, and eleven Vice Presidents.

CASS COUNTY.

The Cass County Agricultural Society held its Fifteenth Annual Exhibition at Dowagiac, October 27th–29th, 1865. The whole number of entries was about 700, and the receipts about $1,000. The amount offered in premiums was $800. The display in all departments except live stock, was good. The few animals that were exhibited were good, but in consequence of the show being held in one corner of the county, the number was quite limited. A particular statement of the finances is not rendered, but the Society is said to be out of debt, and has $500 on hand. It owns ten acres of land at Cassopolis, well enclosed, with a good frame building on it, 26 by 80 feet. The Society has resolved to make further permanent improvements during the season of 1866.

Officers for 1866.—G. S. Wilber, President; D. M. Howell, Secretary; C. H. Kingsbury, Treasurer, with a Board of fifteen Directors.

EATON COUNTY.

The eleventh Annual Exhibition of the Eaton county Agricultural Society, was held at Charlotte, 26th–28th of September, 1865. It was a success, financially and otherwise, though the fee for annual membership was only fifty cents for members of the Society for 1864, and one dollar for new members. The number of entries was 1,400. There was a good show of horses, and an extra one of sheep. The Vermont sheep of Messrs. Colgrove & Brackett, attracted much attention. The display of apples, pears, peaches and grapes, it is said, would have done credit to any county show in Western New York. Much of the county is well adapted to these fruits, and considerable attention is given to their cultivation. No statement of the finances is rendered, but the Society appears to be in a good condition. It has just built a new hall.

Officers for 1866.—Osman Chappell, President; T. D. Green, Secretary; E. A. Foote, Treasurer, with a Board of six Directors, and fifteen Vice Presidents.

GENESEE COUNTY.

The sixteenth Annual Exhibition of this Society was held on the Society's grounds at Flint, on the 27th–29th of September, 1865, and was more numerously attended than any previous exhibition. The record shows an increase of 318 members, over those of 1864, and the number of visitors was, it is said, augmented in like proportion. The entries were 1,077, against 759 for 1864. The receipts from all sources amounted to $1,608 36, being nearly sixty-eight per cent. in excess of the largest receipts at any previous show. The successful result enabled the Society to pay the heavy cost of new buildings, defray all expenses attending the show, discharge the interest and pay a portion of the principal of the debt for the purchase of land, provide for all the premiums awarded, and carry a surplus to next year's account. The exhibition is said to have been fine—especially in horses, sheep, fruit and vegetables. The address was delivered by Dr. Daniel Clark, of Flint.

From the able and interesting report of the Executive Committee of this Society, on "the condition of the agriculture, horticulture, and manufactures, for the County of Genesee, for the year 1865," it appears that the yield of most crops was good.

Of winter wheat, owing to the partial failure of the crop in 1864, there was a less breadth of land sown than usual. The yield for the county is estimated at fifteen bushels per acre. Little complaint was heard of midge or rust. The quality was fine, and it was harvested in good order. Spring wheat was sown to a small extent, and gave a fair crop.

Indian corn, notwithstanding that it suffered severely in the spring from the ravages of worms, causing many fields to be planted a second, and some a third time, turned out the finest crop, both as to quantity and quality, ever obtained in the county. The average yield is placed at forty bushels to the acre.

The crop of oats is also considered the largest ever obtained in the county, the average yield being put at forty bushels to the acre. Not much barley was sown. Buckwheat, plentiful, and of superior quality.

Beans were not so extensively planted as formerly, but they yielded well and were of good quality.

Clover-seed was obtained in large quantity; hay was an average crop, and of good quality. The good quality is attributed in a great degree, to the use of the mowing machine. Without this, the "catching" weather during the season of haying, would have greatly damaged the crop.

The potatoe crop was extraordinary, never having been equaled, it is said, in quantity, nor excelled in quality. Few cases of rot occurred, and these only on wet land. Turnips, mangel wurzel, and other root-crops, afforded ample returns.

Sorghum is attracting a greater amount of attention than formerly, and it is said, would be more extensively grown but for the scarcity of machines for the manufacture of syrup and sugar.

Fruits may be said to have done well in the county. Apple trees made a larger growth than usual, but the crop was quite varying in yield. The trade in apples is gradually increasing in the county. Large quantities were shipped to eastern and northern markets, at remunerative prices. As an evidence of the extent of this traffic, it is mentioned that over one thousand barrels were at one time lying at the Grand Blanc railroad station, awaiting transportation. Pears are attracting attention; trees are being numerously planted, and are found to do well. Few peaches were produced in 1865, and not many plums. The culture of grapes is increasing extensively, and a fine display of this fruit was made at the annual show.

The diminution of cattle alluded to in the report of last year, still continues. The scarcity of fodder for the winter of 1864-5, in conjunction with high prices, induced farmers to part with all they could spare, and more than they ought to have spared. The consequence is, a decided scarcity, with exportation still going on, under the stimulus and temptation of large prices, by which the want of young cattle will soon be seriously felt. Unfortunately, too, the interest formerly felt for the improvement of this class of stock, seems to be falling off. Another change noticed is, that a few years ago the Shorthorns were so much in favor with the stock-raisers of the county, that they overshadowed other breeds. Now, a growing interest in the Devons is observed, and the Ayrshires are taking their places among the candidates for favor.

The horses of the county are considered of so good a quality that they are justly regarded with pride. A heavier class for farm-work is coming into use.

Sheep and wool continue to form the leading interest with the farmers of the county. Some high-priced Merino sheep have been introduced from Vermont, and several long-wooled sheep from Canada. Some statistics of the wool-trade in the county are given, showing that for the year 1865, the quantity marketed at Flint, was 579,000 lbs., at an average price of about 56 cents. Included in this quantity, was 25,000 lbs. from Lapeer county. The quantity marketed at Holly, Fentonville, and other points in the county, is put at 150,000 lbs.;

making the total produced and sold in the county, 700,000 lbs. In regard to the condition of the wool as brought to market, it is said "no particular improvement is noticed this year." It is added: "The same serious objections occur to a great extent that have been formerly noticed; want of thorough washing, unwashed tags, and the use of heavy black twine for tying up. A marked improvement as to *grade* is noticed, which is very creditable to those parties who take special care and pains in this direction."

Hogs have been scarce in the county, and pigs are in demand at high prices. Owing to the abundance of corn, the hogs slaughtered averaged heavier this year than usual. Some attention is given to improved breeds, and specimens of the Essex have been introduced, which are well liked.

The manufactures of the county remain in a flourishing condition; and labor-saving machinery continues to spread its alleviating influence over the farmer's toils, as its benefits become more extensively recognized.

Officers for 1866.—C. H. Rockwood President; F. H. Rankin, Secretary; Harlow Whittlesey, Treasurer; J. L. Gage, Oren Stone, Auditors, with an Executive Committee consisting of seven members, and twenty-one Vice Presidents.

A Sheep-Breeders' and Wool-Growers' Association has been formed for this county, and its first annual meeting for the election of officers was held at Flint on the 10th of January, 1866, on which occasion the following officers were chosen:

J. W. Begole, President; Elisha Larned, Henry Schram, Charles Bates, Vice Presidents; F. H. Rankin, Secretary; J. C. Dayton, Treasurer, with a Board of Auditors, consisting of three members, and an Executive Committee, consisting of seven members.

The Association resolved to hold a "Sheep-Shearing Festival" on the 9th and 10th of May, 1866, on the show grounds of the Genesee County Agricultural Society.

HILLSDALE COUNTY.

The Fifteenth Annual Exhibition of the Hillsdale County Agricultural Society, was held on the grounds of the Society, at Hillsdale, on the 4th–6th October, 1865. The entries were upwards of 700, and the total receipts from the show are put down at $2,449 80. Among the items included in this amount, were $900 for tickets to the Dining Hall, $447 for membership tickets, $801 for tickets sold at the gates for 20 cents each, $7 40 in *fines for jumping fence*, and $35 in *fines for pilfering*. The Society owns twenty-four acres of ground within the corporate limits of the village of Hillsdale, purchased three years since at $100 per acre. It has been largely improved the past year by private enterprise, and it is proposed to expend $1,000 of the money received this year, in further improvements on the land, and in the payment of the debts due on it, leaving $1,450 for the payment of premiums, and current expenses.

Officers for 1866.—Geo. W. Underwood, President; F. M. Holloway, Secretary; D. Beebe, Treasurer, with three Vice Presidents and an Executive Committee consisting of eighteen members.

THE FARMERS', MECHANICS' AND STOCK BREEDERS' ASSOCIATION, OF JONESVILLE.—This Association held three exhibitions during the past season, viz: a Sheep-Shearing Festival at their show ground, in Jonesville, on the 12th of May; a Patriotic Festival and Horse-Show on the 4th of July, and the Annual Show, on the 27th–29 days of September.

At the Shearing, the entries were numerous, and the show of Merino sheep was particularly good. The number of sheep would doubtless have been increased, and the number of people in attendance greater, if it had not been unusually cold weather for the time of year. A lecture on sheep and wool was delivered on the occasion by Sanford Howard, Secretary of the State Board of Agriculture, which was received with tokens of approbation.

The receipts at the Shearing, were,	$102 50
Premiums paid at the same,	134 00
Incidental expenses,	53 94

In addition to the premiums usually offered on such occasions, special premiums of liberal amounts were offered for *cleansed fleeces*—the first attempt, it is believed, to introduce this important test into this State. The result seemed to surprise many, on account of the large shrinkage or waste in going through the process of cleansing. Ten fleeces were entered for scouring. The following table shows the weight of the fleeces before and after being cleansed:

No.		Weight of fleece, uncleansed.	Weight of cleansed fleece.	Loss in cleansing.	Loss per cent. in cleansing.
1.	Ram.	9 lbs. 8 oz.	3 lbs. 14½ oz.	5 lbs. 1½ oz.	.588
2.	do.	14 " 8 "	5 " 15½ "	8 " 8½ "	.588
3.	do.	14 " 8 "	5 " 10½ "	8 " 5½ "	.609
4.	do.	16 " 0 "	4 " 5½ "	11 " 10½ "	.728
5.	do.	15 " 0 "	6 " 1½ "	8 " 14½ "	.593
6.	do.	11 " 0 "	4 " 3½ "	6 " 12½ "	.616
7.	do.	9 " 8 "	3 " 12½ "	5 " 3½ "	.601
8.	Ewe.	11 " 8 "	4 " 12½ "	6 " 3½ "	.584
9.	do.	10 " 8 "	3 " 12½ "	6 " 11½ "	.633
10.	do.	12 " 0 "	4 " 10½ "	7 " 5½ "	.611

At the Horse-show the entire receipts were,	$573 20
Premiums and purses paid,	310 00
Incidental expenses,	104 24
At the Annual Exhibition the receipts were,	698 00
Premiums, &c., paid,	486 73
Other expenses,	100 00

The entire amount received for the year, after paying the premiums, purses, and incidental expenses, has been expended in permanent improvement of the grounds owned by the Association.

Officers for 1866.—Geo. C. Munro, President; Witter J. Baxter, Secretary; E. O. Grosvenor, Treasurer, with a Board of Eleven Directors.

IONIA COUNTY.

The Annual Exhibition of the Ionia County Agricultural Society, was held at Ionia on the 4th and 5th days of October, 1865. The show of fruits and vegetables is said to have been good, as well as that of horses and cattle, and the show of sheep, superior. The receipts of the Society were $350, which amount was paid in premiums. The number of members is one hundred and twenty-five.

Officers for 1866.—Alonzo Sessions, President; E. P. Kelsey, Secretary; Fred. Hall, Treasurer.

JACKSON COUNTY.

The Annual Exhibition of the Jackson County Agricultural Society was held at Jackson, September 27th–29th, 1865. The general display seems to have been creditable, and the Society appears to be prosperous. The statement of receipts and expenditures for the year 1865, to November 7th, is as follows:

EXPENDITURES.

Salary of Secretary,	$100 00
Salary of Treasurer,	25 00
Repairs of buildings,	107 91
Current expenses,	491 07
Acct. not audited, estimated at,	25 00
Amount of premiums awarded,	443 00
Balance,	711 46
	$1,903 44

RECEIPTS.

Balance on hand,	$123 36
Received for rent, &c.,	93 00
Sale of tickets at Annual Show,	1,687 08
	$1,903 44

The Secretary of this Society is W. Budington, of Jackson. A full list of the officers for 1866, has not been obtained.

KALAMAZOO COUNTY.

The Twentieth Annual Exhibition of the Kalamazoo County Agricultural Society, was held at Kalamazoo during the last week in September, 1865. The display in some departments was good, but the show of cattle is represented as "extremely meagre." It is said that "the interest in cattle has given way to the sheep and wool interest." The sheep department is said to have been well sustained, and the show of horses is spoken of as good. No statement of the financial affairs of the Society has been returned.

Officers for 1866.—Wm. H. Cobb, President; E. O. Humphrey, Vice President; H. E. Hoyt, Secretary; H. F. Cook, Treasurer, with an Executive Committee consisting of five members.

KENT COUNTY.

The Seventeenth Annual Exhibition of the Kent County Agricultural Society, was held at Grand Rapids, September 28th–30th, 1865. Most departments appear to have been creditably filled. There appears to to have been a fair show of fruit, and it is mentioned that grape culture is attracting considerable attention in the county. No statement of the finances of the Society is rendered, and the list of officers for 1866 has not been returned.

LAPEER COUNTY.

The Eighth Annual Exhibition of the Lapeer County Agricultural Society, was held at Lapeer, 4th–6th of October, 1865. All classes of the exhibition were well filled, except those of swine and poultry. The county can boast of some very fine Devon cattle, and many good grades of that breed. Sheep of seperior quality are also numerous. Choice Merinos have been introduced from Vermont, and fine long-wooled sheep from Canada, and the county is in a fair way to stand prominently among leading sheep and wool-growing counties of the State.

By a resolution of the Society, the citizens of Macomb county are allowed to compete with those of Lapeer, for the premiums offered on horses, cattle and sheep; and the Macomb County Agricultural Society has extended the same privilege to the citizens of Lapeer.

The Society is reported to be in a very prosperous condition. The receipts at the show were over one thousand dollars. The Society is out of debt; it owns no land, but has leased for twenty years at $100 a year, a tract of sufficient extent for holding thereon its exhibitions, and has erected comfortable buildings for all the purposes required.

Officers for 1866.—Rufus Pierson, President; R. G. Hart, Secretary; M. B. Smith, Treasurer, with two Vice Presidents and a board of seventeen Directors.

LENAWEE COUNTY.

The Annual Exhibition of the Lenawee County Agricultural Society was held at Adrian, October 11th–13th, 1865. The general display appears to have been creditable, both as to extent and quality, and the Society appears to be in a flourishing condition. The Society has very good grounds, near the city of Adrian, with a large and convenient Hall and other buildings necessary for holding its exhibitions. The grounds and the erection of the buildings have been somewhat expensive, and the society appears to be still in debt to the amount of about $1,700 50.

At the Annual Meeting, held on the 26th of January, 1866, the retiring President, C. H. Dewey, delivered an interesting address, in which he gave an encouraging view of the state of agriculture in the county. He remarked that there had not been a year since the settlement of the county, when the labors of the husbandman were more abundantly rewarded, than during the last, and that improvements of most kinds had been carried forward with more than ordinary zeal. He gave the products of the past year as follows:

Wool, pounds,	550,000
Wheat, bushels,	500,000
Corn, "	1,000,000
Potatoes, "	250,000
Apples, barrels,	100,000
Hay, tons,	50,000
Pork, pounds,	3,500,000
Butter, "	1,100,000
Cheese, "	225,000
Sugar, "	5,000
Molasses and Syrup, mostly Sorghum, gallons,	45,000

In speaking of the general progress and improvement of the age, Mr. Dewey observed that: "A single engine now carries at the rate of 500 miles per day, the same quantity of goods, which, less than fifty years ago, required 750 horses to haul at the rate of 25 miles per day. In the business of weaving, one man now does with ease, what it taxed the hand labor of 1,200 persons to perform before the invention of the power loom. This is emphatically an age of progress. The wealth of cities, the power of armies, the greatness of nations, the force and life of society, are built on agriculture."

Hence he argued that it was the duty of every citizen to encourage and aid all measures for the advancement of agriculture, and especially to second the efforts of agricultural societies in this direction.

Officers for 1866.—F. J. Buck, President; J. I. Knapp, Secretary; S. E. Hart, Treasurer, with a Board of twenty Directors.

LIVINGSTON COUNTY.

The Thirteenth Annual Exhibition of the Livingston County Agricultural Society, was held on the Society's grounds in Howell, September 26th–28th, 1865. The Secretary, E. F. Burt, of Howell, writes: "The show was, financially a success, the receipts amounting to $850, being about $200 in excess of any former year, and nearly $300 above all expenses. The latter amount is to be expended in improving the grounds, and in the erection of an additional frame building. The Society owns six acres of grounds, and is free from debt. The tract is well enclosed, and there is on it one good frame building and two temporary ones, besides the office."

But notwithstanding the show was well attended, the Secretary states that the display in many departments fell much short of what it should have been. Various reasons are assigned for the deficiency, some persons imputing it to want of "excitement," &c. In reference to the latter point, the Secretary remarks: "Those State and County Societies which have turned their exhibitions into displays of horse-racing, may succeed for a time, but it will be at the expense of practical utility. I think our Society will not go into that business."

The show of horses is said to have been very good. Of cattle, it was said there were some fine short-horns and Devons, and several cross-breds, but the number was small. Sheep were not numerous, but some fine ones were exhibited. Hon. Wm. Ball presented sheep to which were awarded the first premium at the State Show, the week previous, and it is said there were a few others equally meritorious. The Society has resolved to hold a public sheep-shearing at Howell on the 15th and 16th days of May, 1866.

Officers for 1866.—J. M. La Rue, President; Albert Tooley, Secretary; Wm. B. Smith, Treasurer, with a Board of five Directors.

MACOMB COUNTY.

This Society held its second public sheep-shearing, on its grounds at Romeo, on the 7th and 8th days of June, 1865. The Secretary of the Society, C. W. Whitney, states that it did not attract as much attention as was expected. Premiums were awarded in the order of the following list. It was required that all sheep should be "well washed."

	Rams—three years old and over.	Weight of fleece.
1.	Loren Andrus, Washington,	15 lbs. 2 oz.
2.	George Chandler, Romeo,	10 " 08 "
	Rams—two years old.	
1.	Ira H. Butterfield, Jr., Utica,	16 " 00 "
	Rams—one year old.	
1.	Stout & Dewey, Troy,	11 " 15 "
2.	Harvey Mellen, Romeo,	9 " 02 "
	Ewes—best five, three years old or over.	
1.	Harvey Mellen,	36 " 00 "
2.	Loren Andrus,	32 " 00 "
	Ewes—best five, two years old.	
1.	Loren Andrus,	38 " 01 "
	Ewes—best five, one year old.	
1.	P. M. Bentley, Macomb,	40 " 12 "
2.	Harvey Mellen,	34 " 10 "
3.	Loren Andrus,	32 " 09 "

In the following classes, the requisitions were, that the sheep "were shorn in 1864 and again in 1865," from which it is inferred that it was the object to bring together sheep that were shorn at the shearing of this Society in 1864, to be shorn a second time at the shearing of 1865.

Rams—three years old and over.

	Weight of fleece.
1. Ira H. Butterfield, Utica,	15 lbs. 8 oz.
2. James M. Thorington, Romeo,	18 " 03 "

Rams—two years old.

1. Ira H. Butterfield,	11 " 12 "

Ewes—best ten, three years old and over.

1. Ira H. Butterfield, Jr.,	66 " 00 "
2. Harvey Mellen,	67 " 13 "

Ewes—best ten, two years old.

1. Harvey Mellen,	66 " 00 "
2. Ira H. Butterfield, Jr.,	61 " 10 "

It is noted that the wool of the ewes for which the first premium was awarded, in the class three years old and over, and that of those for which the second premium was awarded in the class two years old, was in "good condition, and very fine." It is also noted that the fleeces of the ewes for which the second premium was awarded in the class three years old and over, and those of the ewes for which the first premium was awarded in the class two years old, "were put up without any tag-locks." Nothing is said of the breed of any of the sheep, but it is presumed they were all Merinos. The exact ages of the fleeces are not stated.

The regulations in reference to this sheep-shearing, besides requiring that all sheep should be well washed, specified that the committee would regard the "quantity and quality" of wool, and would examine the sheep before and after shearing; that all ewes three year old and over shall have reared a lamb in 1865; that an entrance-fee of fifty cents should be paid on each entry, except in the class "to be shorn in 1864 and 1865," in which class an entrance fee of ten per cent. of the premium competed for would be required, one dollar of which must have been paid in 1864; that competition in all classes would be open to the State. The weights of the sheep are not mentioned.

The sixteenth Annual Exhibition of the Macomb County

Agricultural Society, was held on the Society's grounds at Romeo, September 27th–29th, 1865. The number of people in attendance was larger than has attended any former show of the Society. The number of cattle and horses was not as large as at some former exhibitions, but their quality was deemed superior. Some good Short-horn cattle were exhibited, among which were several owned by George W. Phillips. Devons were more numerous, and comprised some good specimens, especially several owned by P. K. Leach, of Utica. The display of sheep was very large for a county show, and comprised some excellent specimens of Merinos. The show of fruit was good, embracing numerous specimens of fine apples—for which the county is celebrated—also handsome specimens of choice varieties of pears, as well as fine samples of Delaware, Diana, Concord, and other varieties of grapes. The annual address was delivered by Sanford Howard, Secretary of the State Board of Agriculture. The financial affairs of the Society are stated by the Treasurer, as follows:

RECEIPTS.

1865.		
Dec. 14.	Money on hand at time of last settlement,	$ 28 34
	Interest on Bonds of Armada,	34 40
	Receipts at Shearing Festival,	50 60
	" Annual Show,	1,232 00
	Principal on Armada Bonds,	400 00
		$1,745 34

EXPENDITURES.

Paid orders for Premiums,	$1,286 28
Cash on hand Dec. 14th, 1865,	458 92
Postage to date,	14
	$1,745 34

Officers for 1866.—Charles Andrews, President; Hiram Andrews, Vice-President; C. W. Whitney, Secretary; A. W. Sterling, Treasurer; with a Board of ten Directors.

MONROE COUNTY.

A public Sheep-Shearing was held by this Society, on the 15th of June, 1865, at which it is said, there was a large attendance of people, and a spirited competition for the premiums offered. It is not stated what were the particular regulations for the trial, or whether the sheep were washed or not, except in a single instance; but from the weights of the fleeces, as reported, it is inferred they were not washed. The weights of the sheep are given, but it is not stated whether the weights were taken before or after shearing. The rule on which the premiums were awarded is not stated. The premiums were awarded in the following order:

	Weight of Sheep.	Weight of Fleece.
Rams—three years old or over.		
1. A. J. Nichols,	125 lbs.	21 lbs. 00 oz.
2. L. Welch,	113 “	20 “ 04 “
3. J. R. Grosvenor,	122 “	17 “ 04 “
Rams—two years old.		
1. George King,	102 “	16 “ 08 “
2. G. R. Hurd,	95 “	16 “ 12 “
3. W. R. Knowlen,	124 “	16 “ 04 “
Rams—one year old.		
1. W. J. Kelley,	79 “	14 “ 08 “
Ewes—three years old or over.		
1. J. R. Grosvenor,	72 “	14 “ 08 “
2. H. B. Hurd,	71 “	10 “ 04 “
3. A. McIntire,	79 “	11 “ 00 “
Ewes—two years old.		
1. G. R. Hurd,	60 “	10 “ 00 “
2. J. Davenport,	72 “	10 “ 04 “
3. W. R. Knowlen,	57½“	7 “ 08 “
Ewes—one year old.		
1. G. & J. Bradford,	42 “	4 “ 08 “
2. W. J. Kelley,	57½“	7 “ 08 “

The sheep comprised in the above classes are placed under the head of “fine wools,” from which it is inferred that they were Merinos. Under the head of “coarse wools,” a premium was awarded to J. N. Hathaway, for a Leicester ram, one year old, which weighed 85 lbs., and the fleece, 9 lbs.; also to J. R. Grosvenor, for a South Down ram, age not mentioned, which weighed 140 lbs., and the fleece, 6 lbs. 4 oz.

It will be seen that in some instances the sheep which gave the greatest weight of fleece in proportion to carcass received a lower premium than others. For instance, in the class of two-year-old rams, Mr. Hurd's weighed seven pounds less than Mr. King's, and had a heavier fleece by four ounces; yet Mr. King's takes the first, and Mr. Hurd's the second premium. No explanation of this is given.

The fifteenth Annual Exhibition of the Society was held at Monroe September 29th and 30th, 1865. It appears to have been well attended, and the Society is represented as in good condition.

In regard to financial affairs, the total receipts for the year 1865, are stated at $597 74, and the total expenses at $483 28.

Officers for 1866.—J. R. Grosvenor, President; Wm. P. Gale, A. J. Keeney, Vice Presidents; M. D. Hamilton, Secretary; Caleb Ives, Treasurer.

OTTAWA COUNTY.

The tenth Annual Exhibition of this Society was held on the Society's grounds near Lamont, September 27th–29th, 1865. The attendance is said to have been very large, and the display of animals, farm products, and miscellaneous articles very good, the show of fruit being unsurpassed. The address was delivered by Hon. Wm. M. Ferry, Jr. The financial condition of the Society is stated as follows:

RECEIPTS.

Membership tickets,	$204 00
Gate tickets,	138 00
Rentals,	35 00
	$377 00

EXPENDITURES.

Printing,	$ 73 60
Repairs, fences, &c.,	22 25
Incidentals,	46 62
Premiums awarded,	269 50
	$411 97

Officers for 1866.—T. B. Lillie, President; Sylvester Luther, Secretary; Russel Baxter, Treasurer.

SHIAWASSEE COUNTY.

The Secretary of this Society writes: "The Shiawassee County Agricultural Society is in a healthy condition. The Annual Show was held at Owosso, October 4th–6th, and was very largely attended. Owosso has been selected as the place for holding the Annual Shows for the next ten years, and the city has caused to be erected on the Society's grounds, convenient buildings, at an expense of one thousand dollars. The number of entries at the last show, was 555, and the receipts were $819. The amount awarded in premiums was $282 75. It is proposed to enlarge the premium-list next year."

It appears that this Society offers premiums for the best cultivated farms, and that E. D. Barns, of Burns, received the first, and I. Gale, of Bennington, the second premium under this head, for 1865.

Officers for 1866.—E. D. Barnes, President; A. G. Young, Secretary; N. H. Robinson, Treasurer, with an Executive Committee, consisting of five members, and sixteen Vice Presidents.

ST. JOSEPH COUNTY.

This Society held a public Sheep-Shearing on its grounds at Centreville, on the 18th of May, 1865. Much interest was manifested in the affair, and eighty-six sheep were exhibited. The points by which the awards were made are stated as follows: 1. Weight of wool according to weight of sheep. 2. Form of the sheep. 3. Quality of the fleece, whether fine or coarse. 4. Condition of the fleece, whether clean, oily, or foul. 5. Time since last sheared. No requisition seems to have been made in regard to washing the sheep, and it is not stated whether the sheep were washed or not. A table is given, specifying the time when the sheep were sheared in 1884, the weight of each, and the weight of fleece; but it is not stated whether the sheep were weighed before or after being sheared. The fleeces of rams, from two to four years old, weighed from 10¼ to 21¼ lbs. each. Most of them ranged from 15 to 17 lbs.—five only overrunning the latter figures. The fleeces of the ewes weighed from 11½ to 12¾ lbs. each. It is presumed that the fleeces were, in all cases, unwashed.

The Sixteenth Annual Exhibition of this Society was held at Centreville, September 27th–29th, 1865. The entries numbered 550. The financial affairs of the Society are stated as follows:

RECEIPTS.

Amount received from County Treasurer, for two years, (by mistake none was received from this source for 1864,).....	$ 303 45
From tickets sold at the Shearing,..........................	89 25
" " " Annual Show,........................	1,371 25
From Entry-fees,..	14 70
From stands, shows, &c.,....................................	32 00
	$1,810 65

EXPENDITURES.

Premiums at Sheep-Shearing,................................	$ 81 00
" Annual Show,..............................	548 75
Judges Stand,..	155 00
Expenses for the year 1865,..................................	676 87
Amount on hand Dec. [illegible]th, 1865,..............................	394 03
	$1,810 65

Officers for 1866.—Henry Tracy, President; L. F. Talbot, Secretary; Edmund Stears, Treasurer; with a Board of five Directors.

ST. CLAIR COUNTY.

The Tenth Annual Exhibition of the St. Clair County Agricultural Society was held at St. Clair, September 27th–30th, 1865. The receipts amounted to $830. The amount paid out in premiums, was about $250. The exhibition is said to have been creditable, and everything indicates increased prosperity. The names of the officers for 1866, are not returned. The Secretary is Wm. Grace, of St. Clair.

TUSCOLA COUNTY.

A Society to be known as the Tuscola County Agricultural Society, was organized at Vassar, on the 8th day of January, 1866. A full list of officers has not been received. The Secretary is J. Dennison Lewis, of Vassar.

CONTENTS.

PAGE.

Characteristics of the Season of 1865, 7
Yield of Crops in 1865, 9
Advantages of Michigan for the Production of Fruits, 13

New Crops:

Sorghum, 17
Tobacco, 18
Rhubarb, 19

Injurious Iesects:

The Canker-Worm, 22
The New Potatoe-Bug, 29
The Army-Worm, 37
History and Characteristics of Galloway Cattle, 39
Cotswold Sheep, 57
South-Down Sheep, 67
The Wells and Dickinson Merino Sheep, 69
The Rich Merino Sheep, 77
Public Sheep-Shearings, 83

Breeding Horses:

Cross-breeding illustrated by reference to Sheep, 91–94
Original breeds of English Horses, 94
The Pack-horse the parent of Fast Trotters, 97
The Norfolk Trotters, "Bellfounders," &c., 97, 109, 110
Comparison of the thorough-bred with other Horses, 96–100
English mode of raising thorough-breds, 101
The Hunter, how bred, 106
Examples of successful cross-breeding in Horses, 108–113
Summary of advantages of cross-breeding, 114–117

Management of Pastures:

The old pastures of England, New England and New York, 119–128
The subject of plowing pastures discussed, 121–128
Best grasses for pastures, 126, 129
Conclusions respecting permanent pastures, 131

The Factory System of Cheese-Making:

Extracts from Mr. Willard's Address, 134–155
Articles of Association for Cheese-making Companies, 155
English Cheese compared with American, 156
Cheshire Cheese, 164

PAGE.
Cheddar Cheese, ... 143, 166
American Cheese in England, ... 167
How is improvement to be made? 172

DISEASES OF CATTLE:

The Cattle-Plague or Rinderpest, ... 177
Act of Congress prohibiting the importation of Cattle, ... 178
The Infectious nature of the disease, ... 179
History of the disease, ... 180
Symptoms and treatment, ... 198–200
Ravages of the disease in England, ... 200

CAUSES OF UNPRODUCTIVENESS IN SOILS:

Summary of points, ... 205
Questions which can be answered by chemical analysis, ... 223
Questions which cannot be answered by chemical analysis, ... 225

THE STATE AGRICULTURAL COLLEGE:

Objects of the Institution, ... 227
Number of Students for 1865, ... 227
Crops of the College Farm for 1865, ... 228
Live Stock—crosses of breeds of cattle, ... 229
Receipts and Expenditures of the Farm for 1865, ... 230
Returns from the Garden for 1865, ... 231
Stock purchased for the Farm, 1865, ... 232
Donations of Animals, Implements, &c., ... 232
Donations to the Museum, Laboratory, Library and Reading-Room, 233
EXPERIMENTS IN TOP-DRESSING GRASS-LANDS, ... 235

OBSERVATIONS ON THE METEOROLOGY OF MICHIGAN:

Physical Geography of the Lower Peninsula, ... 241
Instruments for making observations, ... 242
Winds of Central Michigan, ... 245
Rainy winds, ... 247
Evaporation and Rainfall, ... 249
Necessity of timber-belts as a means of protection from cold winds, ... 247, 250–253

REGISTER OF METEOROLOGICAL OBSERVATIONS:

Monthly Tables, ...
Winds, ... 257
Abstract of Meteorological Observations for 1865, ... 257
REPORT OF THE TREASURER OF THE STATE AGRICULTURAL COLLEGE FOR 1865, ... 259
WARRANT STATEMENT, ... 265
SECRETARY'S ACCOUNT, ... 273
RETURNS FROM AGRICULTURAL SOCIETIES, ... 275

ILLUSTRATIONS.

Prize Galloway Bull, (Frontispiece.) Page.

The Canker-Worm, ... 23

Merritt's Tree-Protector, ... 27

Galloway Heifer, ... 54

Cotswold Ram, ... 57

South-Down Ram, ... 67

Wells & Dickinson Merino Ewe, ... 69

Rich Merino Ewe, ... 77

ADDENDA.

After the body of this report was printed, the returns of the OAKLAND COUNTY AGRICULTURAL SOCIETY were received, which are presented in a condensed form as follows:

The Seventeenth Annual Meeting of the Society, for the election of officers, &c., was held in Pontiac on the 9th of January, 1865—the President, C. W. Green, in the chair. Z. B. Knight, the Treasurer of the Society, presented his report for the current year, of which the following is a summary:

1864.	RECEIPTS.	
Jan. 12.	Balance on hand,	$ 552 52
Oct.	Receipts of Fair for 1864,	1,442 45
1865. Jan. 9.	Received from County Treasurer, 1-40 mill tax, 1862 and 1863,	472 77
	do for 1864,	239 25
		$2,706 99

EXPENDITURES.	
Paid premiums for 1862,	$ 4 00
" " " 1863,	48 00
" " " 1864,	703 82
" orders for 1862,	60 00
" " " 1863,	177 33
" " " 1864,	305 50
	$1,299 05
1865. Jan. 9. Balance on hand,	1,407 94

The officers elected for the current year were, Edwin Phelps, President; Joseph R. Bowman, Secretary; Z. B. Knight, Treasurer, with five Vice Presidents and an Executive Committee, consisting of five members. G. M. Trowbridge, of Birmingham, was unanimously recommended for nomination as a Member of the State Board of Agriculture.

February 10th and 11th, 1865, the Annual Meeting of the Executive Committee, was held at the Secretary's office in Pontiac, for the purpose of revising the premium list and the transaction of other business. Resolutions was passed inviting the citizens of Macomb county, and the citizens of Plymouth and Livonia, in Wayne county, to compete for the premiums of the Society for 1865.

It was resolved that all exhibitors of horses, cattle and sheep, be required to pay, after having made one entry, an additional entry fee of twenty-five cents on each subsequent entry made for these animals.

It was also resolved, that neither wagons or other carriages be admitted to the show-grounds after the first day of the Exhibition, without the payment of fifty cents each day, for a double carriage or wagon, and twenty-five cents for each single carriage or wagon, and that no horses be tied or left on the show-grounds unless entered for competion, and that none but members of the Society could purchase carriage tickets.

Besides a long list of of premiums of the usual character, liberal ones were offered for " Improved Farms," as follows:

Best cultivated farm of not less than one hundred and sixty acres, reference being had to cultivation, stock, improvements, expenses, products etc., etc.,	$50 00
2d do,	30 00
Best cultivated farm of not less than eighty acres, reference being had to cultivation, stock, improvements, expenses, products, etc., etc.,	30 00
2d do,	20 00

SHEEP-SHEARING.—The Business Committee of the Society, at the request of a number of its members, held a sheep-shearing on the show-grounds of the Society, on the 31st of May, 1865, and, although the notice given of the affair was short, there was a good show of sheep and a fair attendance of farmers and others from Oakland and the adjoining county of Macomb. The premiums were divided into two classes, the first for sheep raised out of the State, and the second for those raised by the exhibitor in the State. On the first class there were sixteen entries, and on the second fourteen.

It appears that the fleeces of forty-five sheep, weighed 472 lbs. 7 oz., or an average of over 10½ lbs. each. Of the forty-five, thirty-two were ewes, leaving thirteen rams, the fleeces of which weighed 192 lbs., or an average of 14¾ lbs each. A two year old ram, exhibited by Ira H. Butterfield, Jr., of Utica, Macomb county, whose fleece weighed 24 lbs. 1 oz., is spoken of as "a splendid animal." It is not stated whether the sheep were washed or not, but it is probable they were not. Nothing is said in regard to the breed or breeds of the sheep, though they were probably Merinos.

A special meeting of the Executive Committee was called on the 10th of July, 1865, for the purpose of considering the propriety of purchasing, of Alonzo Barber, about four acres of land in addition to that previously owned by the Society. It was finally decided to purchase the land, at a price not exceeding $500 per acre, and the bargain was concluded.

It was resolved that persons competing for the premiums on farms, be required to pay entry-fees, as follows: on farms of over 160 acres, an entry-fee of $5; and on farms of 80 acres, and less than 160 acres, an entry-fee of $3—the money to be used for defraying the expenses of the Examining Committee.

The Seventeeth Annual Exhibition of the Society, was held on the Society's grounds, in Pontiac, on the 4th–6th of October, 1865. The whole number of entries was 1,142. Of these 282 were horses, 98 cattle, 49 sheep, 10 swine, 99 farm implements, 51 butter and cheese, &c.

The whole amount offered in premiums by the Society for the current year, was about $3,000, and the amount of premiums awarded was about $1,525. The exhibition was a decided success.

At a meeting of the Executive Committee, held at Pontiac on the 24th of January, 1866, the Committee on Improved Farms made a report, which was substantially as follows:

In the class of farms of not less that 160 acres, three entries were made, viz: C. W. Green, of Farmington, 160 acres; James Bayley, of Troy, 200 acres; Austin N. Kimm, of Novi, 370 acres.

James Bayley was awarded the first premium of $50, and C. W. Green the second, $30.

The decision was not arrived at without the most thorough canvassing of the merits of the several farms entered, the skill of the farmer and the results of his labor for a series of years. Each showed much ability and enterprise, which may be commended as worthy of imitation.

Of farms of not less than 80 acres, but one entry was made, viz.: Joseph A. Durkee, of West Bloomfield, 120 acres. To him is awarded the second premium of $20.

In the appearance of his farm, and in the management of his buildings and fields, no special merit was displayed, but in general farm operations for the making of money, he showed much skill.

A report was made by the Committee on Field Crops, which showed that in most articles of farm produce, good yields were obtained.

C. W. Green read a valuable report on draining and the results on 25 acres of his farm. It was unanimously resolved that a copy of Mr. Green's paper be requested for publication with the proceedings of the Society for the current year. [The paper has not been received.—S. H.]

The receipts and expenditures of the Society for 1865, are stated by the Treasurer as follows:

RECEIPTS.

1865.			
Jan.	9.	Balance from last report,	$1,407 94
May	31.	Received from sale of tickets to the Sheep Shearing Festival,	53 75
May	31.	Received from J. R. Bowman, Secretary Sheep Shearing Festival,	45 05
July	7.	Received of United States for rent of Fair Grounds,	245 00
Oct.	1.	" from A. E. Mather for hay,	7 50

Oct.	1.	Receipts at the Annual Fair for tickets sold, &c.,	$2,839 00
"	1.	Received for licenses, &c.	224 00
"	1.	" from Fox & Smith, for grass seed returned,	1 50
Total,			$4,824 19

EXPENDITURES.

Paid premiums 1863,	$ 14 50	
" " 1864,	106 66	
" " 1865,	1,310 00	
" orders 1864,	69 56	
" " 1865,	3,071 00	
" Treasurer's salary for 1864 and 1865,	80 00	
Bad money on hand,	29 50	
Current funds,	142 97	
		$4,824 19
1866. Jan. 9. Balance cash on hand,		$142 97

In addition to the above receipts, the sum of $1,705 92 was receved from subscriptions and other sources, which was not included in the Treasurer's account, not having passed through his hands, making the whole amount of the receipts of the Society, from all sources, during the current year, $5,122 17.

There was also disbursed during the year, in addition to the amount passing through the Treasurer's hands, the sum of $2,222 36, making the whole amount of disbursements for the current year, the sum of $6,874 08.

RECAPITULATION.

Jan. 9, 1865.	Balance cash on hand,		$1,407 94
	Total receipts from all sources during the year,		5,122 17
	Total receipts and cash,		$6,530 11
Jan. 9, 1866.	Disbursements by Treasurer,	$4,651 72	
	" for work &c., by others,	2,222 36	
			$6,874 08
	Deficit for the year,		$343 97

The Society have purchased during the year, nearly four acres of land, at an expense of $500 per acre, making with what they previously owned, nearly fifteen acres, and have built